WeBWorK assignment number 00_WeBWorK is due : 01/14/2009 at 02:00am MST.

The primary purpose of WeBWorK is to let you know that you are getting the correct answer or to alert you if you are making some kind of mistake. Usually you can attempt a problem as many times as you want before the due date. However, if you are having trouble figuring out your error, you should consult the book, or ask a fellow student, one of the TA's or your professor for help. Don't spend a lot of time guessing – it's not very efficient or effective.

Give 4 or 5 significant digits for (floating point) numerical answers. For most problems when entering numerical answers, you can if you wish enter elementary expressions such as $2 \wedge 3$ instead of 8, $sin(3 * pi/2)$instead of -1, $e \wedge (ln(2))$ instead of 2, $(2+tan(3)) * (4-sin(5)) \wedge 6-7/8$ instead of 27620.3413, etc.

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1. **(1 pt) pl/calculus_and_analytic_geometry_i/hmwk0/prob1.pg**
This problem demonstrates how you enter numerical answers into WeBWorK.

Evaluate the expression $3(-6)(1-8-2(6))$: _____

In the case above you need to enter a number, since we're testing whether you can multiply out these numbers. (You can use a calculator if you want.)

For most problems, you will be able to get WeBWorK to do some of the work for you. For example
Calculate (-6) * (1): _________

The asterisk is what most computers use to denote multiplication and you can use this with WeBWorK. But WeBWorK will also allow use to use a space to denote multiplication. You can either $-6 * 1$ or -6 or even $-6\ 1$. All will work. Try them.

Now try calculating the sine of 45 degrees (that's sine of pi over 4 in radians and numerically sin(pi/4) equals 0.707106781186547 or, more precisely, $1/\sqrt{2}$). You can enter this as sin(pi/4) , as sin(3.1415926/4), as 1/sqrt(2), as 1/2ˆ.5, as 2**(-.5), or in other ways. This is because WeBWorK knows about functions like sin and sqrt (square root). (Note: exponents can be indicated by either ˆ or **). Try it.
$\sin(\pi/4) =$ _________

Here's the **list of the functions** which WeBWorK understands. WeBWorK ALWAYS uses radian mode for trig functions.

You can also use juxtaposition to denote multiplication. E.g. enter $2\sin(3\pi/2)$. You can enter this as 2*sin(3*pi/2) or more simply as 2sin(3pi/2). Try it:

____

Sometimes you need to use ( )'s to make your meaning clear. E.g. 1/2+3 is 3.5, but 1/(2+3) is .2 Why? Try entering both and use the "Preview" button below to see the difference. In addition to ( )'s, you can also use [ ]'s and { }'s.

____

You can always try to enter answers and let WeBWorK do the calculating. WeBWorK will tell you if the problem requires a strict numerical answer. The way we use WeBWorK in this class there is no penalty for getting an answer wrong. What counts is that you get the answer right eventually (before the due date). For complicated answers, you should use the "Preview" button to check for syntax errors and also to check that the answer you enter is really what you think it is.

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2. **(1 pt) pl/calculus_and_analytic_geometry_i/hmwk0/prob1a.pg**
This problem demonstrates how you enter function answers into WeBWorK.

First enter the function sin x. When entering the function, you should enter sin(x), but WeBWorK will also accept sin x or even sinx. If you remember your trig identities, sin(x) = -cos(x+pi/2) and WeBWorK will accept this or any other function equal to sin(x), e.g. sin(x) +sin(x)**2+cos(x)**2-1

____

We said you should enter sin(x) even though WeBWorK will also accept sin x or even sinx because you are less likely to make a mistake. Try entering sin(2x) without the parentheses and you may be surprised at what you get. Use the Preview button to see what you get. WeBWorK will evaluate functions (such as sin) before doing anything else, so sin 2x means first apply sin which gives sin(2) and then multiply by x. Try it.

____

Now enter the function $2\cos t$. Note this is a function of t and not x. Try entering 2cos x and see what happens.

____

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3. **(1 pt) pl/calculus_and_analytic_geometry_i/hmwk0/prob1b.pg**
This problem will help you learn the rules of precedence, i.e. the order in which mathematical operations are performed. You can use parentheses (and also square brackets [ ] and/or curly braces { }) if you want to change the normal way operations work.

So first let us review the normal way operations are performed.

The rules are simple. Exponentiation is always done before multiplication and division and multiplication and division are always done before addition and subtraction. (Mathematically we say exponentiation takes precedence over multiplication and division, etc.). For example what is 1+2*3?

____

and what is $2 \cdot 3^2$?

____

Now sometime you want to force things to be done in a different way. This is what parentheses are used for. The rule is: whatever is enclosed in parentheses is done before anything else (and things in the inner most parentheses are done first).

For example how do you enter

$$\frac{1+\sin(3)}{2+\tan(4)}$$

? Hint: this is a good place to use [ ]'s and also to use the "Preview" button.

____

Here are some more examples:

(1+3)9 =36, (2*3)**2 = 6**2 = 36, 3**(2*2) = 3**4 = 81, (2+3)**2 = 5**2 = 25, 3**(2+2) = 3**4 = 81

(Here we have used ** to denote exponentiation and you can also use this instead of a "caret" if you want). Try entering some of these and use the "Preview" button to see the result. The "correct" result for this answer blank is 36, but by using the "Preview" button, you can enter whatever you want and use WeBWorK as a hand calculator.

____

There is one other thing to be careful of. Multiplication and division have the same precedence and there are no universal rules as to which should be done first. For example, what does 2/3*4 mean? (Note that / is the "division symbol", which is usually written as a line with two dots, but unfortunately, this "line with two dots" symbol is not on computer keyboards. Don't think of / as the horizontal line in a fraction. Ask yourself what 1/2/2 should mean.) WeBWorK and most other computers read things from left to right, i.e. 2/3*4 means (2/3)*4 or 8/3, IT DOES NOT MEAN 2/12. Some computers may do operations from right to left. If you want 2/(3*4) = 2/12, you have to use parentheses. The same thing happens with addition and subtraction. 1-3+2 = 0 but 1-(3+2) = -4. This is one case where using parentheses even if they are not needed might be a good idea, e.g. write (2/3)*4 even though you could write 2/3*4. This is also a case where previewing your answer can save you a lot a grief since you will be able to see what you entered.

Enter 2/3*4 and use the Preview button to see what you get.

____

Professor Swift **JSwift_136**

WeBWorK assignment number 01_Functions_1 is due : 01/16/2009 at 02:00am MST.

The primary purpose of WeBWorK is to let you know that you are getting the correct answer or to alert you if you are making some kind of mistake. Usually you can attempt a problem as many times as you want before the due date. However, if you are having trouble figuring out your error, you should consult the book, or ask a fellow student, one of the TA's or your professor for help. Don't spend a lot of time guessing – it's not very efficient or effective.

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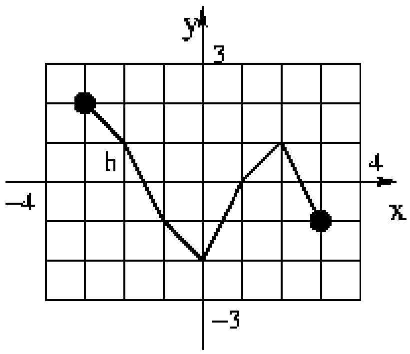
1. **(1 pt) pl/setAlgebra16FunctionGraphs/sw4_2_1.pg**

The graph of the function h is shown.



The domain of h is ____________.
The range of h is ____________.
(Write the domain and range in interval notation.)

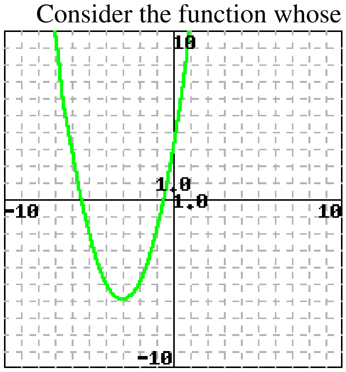
Enter the corresponding function value in each answer space below:

___1. $h(0)$
___2. $h(2)$
___3. $h(-2)$
___4. $h(-3)$

---

2. **(1 pt) pl/setAlgebra16FunctionGraphs/lh2-3_30a.pg**

Consider the function whose graph is sketched:



Find the intervals over which the function is increasing or decreasing. If the answer includes more than one interval write the intervals separated by the "union" symbol, U. You may use "infinity" for ∞ and "-infinity" for $-\infty$. For example, you may write (-infinity, 5] for the interval $(-\infty,5]$ and (-infinity, 5]U(7,9) for $(-\infty,5] \cup (7,9)$.

The interval over which the function is increasing: ________________

The interval over which the function is decreasing: ________________

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3. **(1 pt) pl/setAlgebra15Functions/s0_1_11.pg**

The domain of the function $f(x) = \sqrt{-3x-51}$ consists of one or more of the following intervals: $(-\infty,A]$ and $[A,\infty)$.
Find A _____
For each interval, answer YES or NO to whether the interval is included in the solution.
$(-\infty,A]$ _____
$[A,\infty)$ _____

---

4. **(1 pt) pl/setAlgebra15Functions/p7.pg**

The domain of the function

$$\frac{x+5}{x^2-225}$$

is ____________________
Write the answer in interval notation.
Note: If the answer includes more than one interval write the intervals separated by the union symbol, U. If needed enter $-\infty$ as - *infinity* and ∞ as *infinity* .

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5. **(1 pt) pl/setAlgebra15Functions/p1.pg**

The domain of the function

$$f(x) = \frac{1}{\sqrt{5x+6}}$$

is ____________________
Write the answer in interval notation.
Note: If the answer includes more than one interval write the intervals separated by the union symbol, U. If needed enter $-\infty$ as - *infinity* and ∞ as *infinity* .

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6. **(1 pt) pl/setAlgebra15Functions/s0_1_18a.pg**

The domain of the function $f(x) = \sqrt{18+3x-x^2}$ is the closed interval $[A,B]$
where $A =$ _______________
and $B =$ _______________

7. **(1 pt) pl/setAlgebra15Functions/srw2_1_23.pg**
Given the function

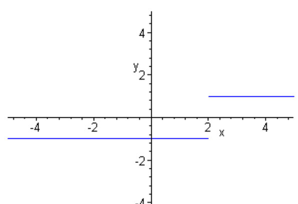
$$f(x) = \begin{cases} x^2+2x, & \text{if} \quad x \le -1 \\ x+4, & \text{if} \quad x > -1 \end{cases}$$

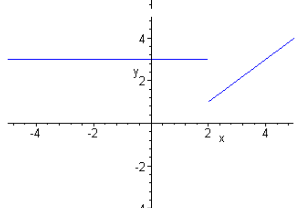
Calculate the following values:
$f(-7) =$ ______
$f(-1) =$ ______
$f(6) =$ ______

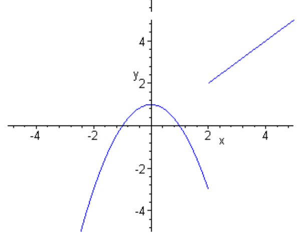
8. **(1 pt) pl/setAlgebra15Functions/srw2_1_33.pg**
Given the function $f(x) = -2+2x^2$, calculate the following values:
$f(a) =$ ________
$f(a+h) =$ ________
$\dfrac{f(a+h)-f(a)}{h} =$ ________

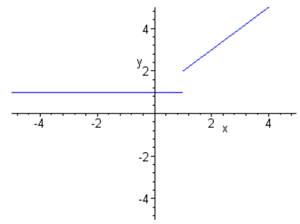
9. **(1 pt) pl/setAlgebra16FunctionGraphs/c4s2p59_72/c4s2p59_72.pg**
Match the functons with their graphs. Enter the letter of the graph below which corresponds to the function.

___1. Piecewise function: $f(x) = 1$ if $x \le 1$, and $f(x) = x+1$ if $x > 1$
___2. Piecewise function: $f(x) = -1$ if $x < 2$, and $f(x) = 1$ if $x \ge 2$
___3. Piecewise function: $f(x) = 1-x^2$ if $x \le 2$, and $f(x) = x$ if $x > 2$
___4. Piecewise function: $f(x) = 3$ if $x < 2$, and $f(x) = x-1$ if $x \ge 2$


A.

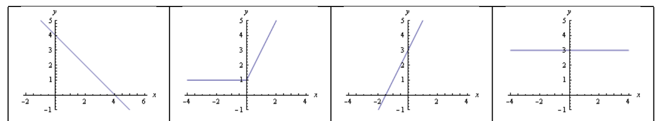

B.


C.


D.

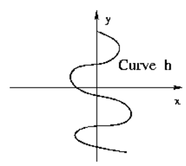
10. **(1 pt) pl/setAlgebra16FunctionGraphs/c4s2p19_40/c4s2p19_40.pg**
Match the functions with their graphs. Enter the letter of the graph below which corresponds to the function.

___1. $|x|+x+1$
___2. 3
___3. $-x+4$
___4. $2x+3$

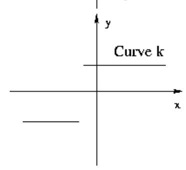


A	B	C	D

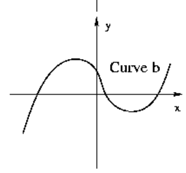
11. **(1 pt) pl/setAlgebra16FunctionGraphs/c2s2p5_7/c2s2p5_7.pg**
Enter "Yes" or "No" in each answer space below to indicate whether the corresponding curve defines y as a function of x.
NOTE: "Y" or "N" will be marked wrong. Enter "Yes" or "No". (WeBWorK is case insensitive, so "yes" or "Yes" are both OK.)



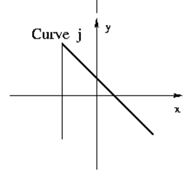
___1.



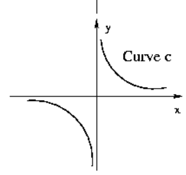
___2.



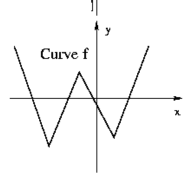
___3.



___4.



___5.



___6.

Professor Swift **JSwift_136**

WeBWorK assignment number 02_Functions_2 is due : 01/23/2009 at 02:00am MST.

The primary purpose of WeBWorK is to let you know that you are getting the correct answer or to alert you if you are making some kind of mistake. Usually you can attempt a problem as many times as you want before the due date. However, if you are having trouble figuring out your error, you should consult the book, or ask a fellow student, one of the TA's or your professor for help. Don't spend a lot of time guessing – it's not very efficient or effective.

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1. **(1 pt) pl/setHagoodPrecalc/linearfunc1.pg**

The linear function f with values $f(-5)=4$ and $f(5)=5$ is $f(x)=$ __________

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2. **(1 pt) pl/setHagoodPrecalc/linearfunc2.pg**

A chair manufacturer finds that it costs 7600 dollars to manufacture 280 chairs and 13675 dollars to manufacture 550 chairs in one day, including all costs associated with the factory and the manufacturing process. Express the cost $C(x)$ to manufacture x chairs assuming that it is a linear function: $C(x)=$ __________

What are the fixed daily costs associated with the manufacuring process, even if no chairs are made? __________

How much does it cost to make each chair, aside from the fixed costs? __________

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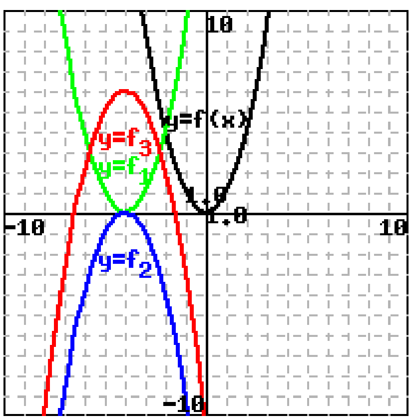
3. **(1 pt) pl/setAlgebra19FunTransforms/lh2-4_23.pg**



The graph of $f(x)=x^2$ is sketched in black and it had undergone a series of translations to graphs of functions f_1 sketched in green, f_2 sketched in blue, and f_3 sketched in red. $f \to f_1 \to f_2 \to f_3$. Use the translation rule and $f(x)=x^2$ to identify the function $f_1(x)$;

$f_1(x)=$______________

Use the translation rule and $f_1(x)$ to identify the function $f_2(x)$;

$f_2(x)=$______________

Use the translation rule and $f_2(x)$ to identify the function $f_3(x)$;

$f_3(x)=$______________

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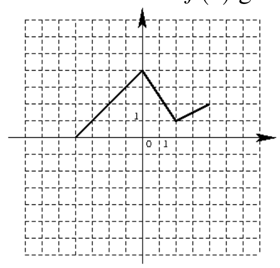
4. **(1 pt) pl/setAlgebra19FunTransforms/SRW2_5_11/srw2_5_11.pg**

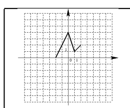
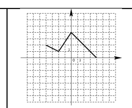
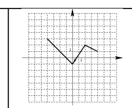
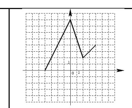
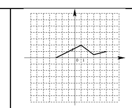
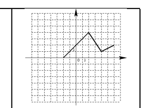
Click on image for a larger view

For the function $f(x)$ given in the graph



Match the following functons with their graphs. Enter the letter of the graph below which corresponds to the function.

___1. $y=f(2x)$
___2. $y=f(-x)$
___3. $y=\frac{1}{2}f(x-1)$
___4. $y=2f(x)$
___5. $y=f(x-2)$
___6. $y=-f(x)+3$

					
A	B	C	D	E	F

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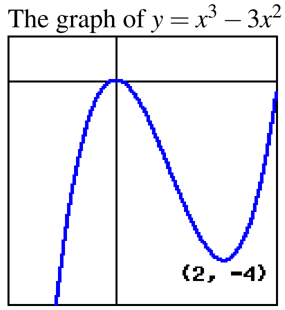
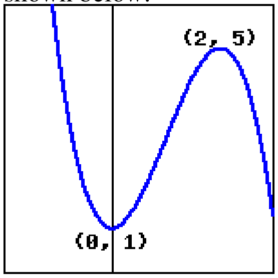
5. **(1 pt) pl/setAlgebra19FunTransforms/lance1.pg**

The graph of $y=x^3-3x^2$ is shown below:



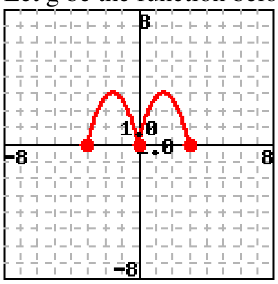
Find a formula for the transformed function whose graph is shown below:



$y =$ ____________________

6. **(1 pt) pl/setAlgebra19FunTransforms/scaling.pg**

Let g be the function below.

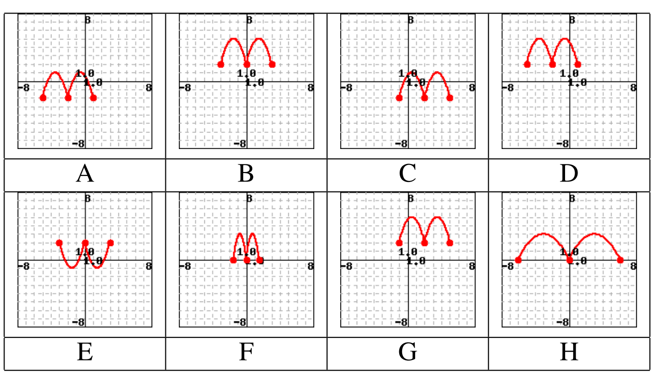


The domain of $g(x)$ is of the form $[a,b]$, where a is ___ and b is ___.

The range of $g(x)$ is of the form $[c,d]$, where c is ___ and d is ___.

Enter the letter of the graph which corresponds to each new function defined below:

1. $g(x-2)+2$ is ___.
2. $g(2x)$ is ___.
3. $2+g(-x)$ is ___.
4. $g(x+2)-2$ is ___.



7. **(1 pt) pl/setAlgebra17FunComposition/beth1.pg**

Given that $f(x) = x^2 - 9x$ and $g(x) = x + 12$, find

(a) $(f+g)(x)$= ____________

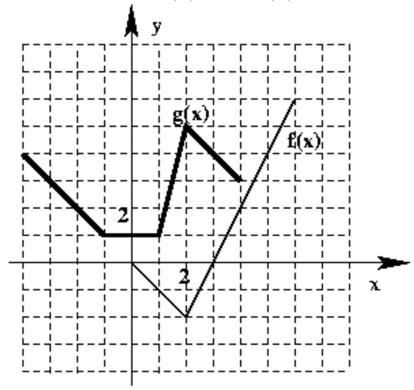
(b) $(f-g)(x)$= ____________

(c) $(fg)(x)$= ____________

(d) $(f/g)(x)$= ____________

8. **(1 pt) pl/setAlgebra17FunComposition/beth2algfun.pg**

For the function $f(x)$ and $g(x)$ given in the graph



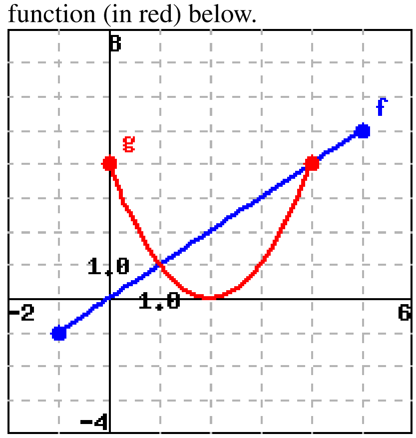
find the corresponding function values. If there is no function value, type DNE in the answer blank.

$(f+g)(0)$ = _____

$(f-g)(0)$ = _____

9. **(1 pt) pl/setAlgebra17FunComposition/ur_fn_2_1.pg**

Let f be the linear function (in blue) and let g be the parabolic function (in red) below.



Note: If the answer does not exist, enter 'DNE':

1. $(f \circ g)(2) =$ ___
2. $(g \circ f)(2) =$ ___
3. $(f \circ f)(2) =$ ___
4. $(g \circ g)(2) =$ ___
5. $(f+g)(4) =$ ___
6. $(f/g)(2) =$ ___

10. **(1 pt) pl/setAlgebra17FunComposition/sw4_7_21.pg**

Given that $f(x) = 8x+4$ and $g(x) = 2-x^2$, calculate

(a) $f \circ g(x)$= ________

(b) $g \circ f(x)$= ________

11. **(1 pt) pl/setAlgebra17FunComposition/sw4_7_45.pg**

Express the function $h(x) = (x-2)^6$ in the form $f \circ g$. If $f(x) = x^6$, find the function $g(x)$.

Your answer is $g(x)$= ______,

12. **(1 pt) pl/setAlgebra17FunComposition/ns1_2_37.pg**

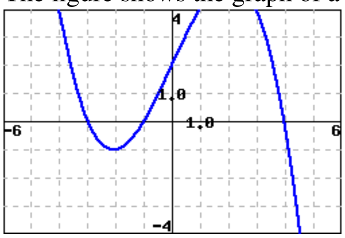
Let $f(x) = \dfrac{1}{4x}$, $g(x) = 6x^2 + 8$, and $h(x) = 8x^3$.

Then $f \circ g \circ h(5) =$______

13. **(1 pt) nauLibrary/setFunctionBasicGraphs/formulaFromPolyGraph.pg**

FORMULA FROM CUBIC GRAPH

The figure shows the graph of a cubic polynomial.



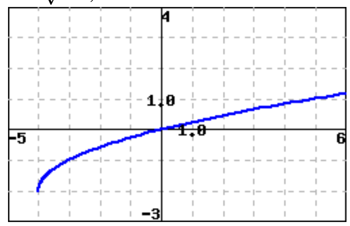
The function graphed is $f(x) =$ ________.

Hint: You may write the function as $f(x) = a(x-b)(x-c)(x-d)$ where b, c, and d, are integers and a is a fraction.

14. **(1 pt) nauLibrary/setFunctionBasicGraphs/formulaFromSqrtGraph.pg**

FORMULA FROM SQRT GRAPH

The graph shown is a shift, also called a translation, of $y = \pm\sqrt{ax}$, where $a = \pm 1$ or ± 2.

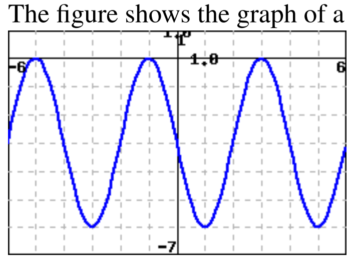


The graph is $y =$ ________.

15. **(1 pt) nauLibrary/setFunctionBasicGraphs/formulaFromTrigGraph.pg**

FORMULA FROM TRIG GRAPH

The figure shows the graph of a trigonometric function.

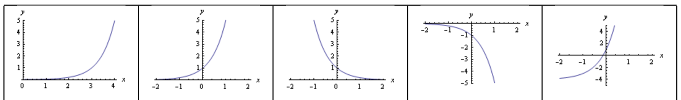


The function graphed is $f(x) =$ ________.

Hint: The function may be written as $f(x) = a\sin\left(\frac{2\pi}{P}(x-b)\right) + c$ or $f(x) = a\cos\left(\frac{2\pi}{P}(x-b)\right) + c$ (or both), where a, b, c, and P, are integers.

1. **(1 pt) pl/setAlgebra28ExpFunctions/c4s1p13_18/c4s1p13_18a.pg**
Match the functions with their graphs. Enter the letter of the graph below which corresponds to the function.

___1. $f(x) = 5^x$
___2. $f(x) = -5^x$
___3. $f(x) = 5^{-x}$
___4. $f(x) = 5^{x-3}$
___5. $f(x) = 5^{x+1} - 4$



A	B	C	D	E

2. **(1 pt) pl/setAlgebra28ExpFunctions/ur_log_1_3.pg**
Starting with the graph of $f(x) = 2^x$, write the equation of the graph that results from

(a) shifting $f(x)$ 6 units downward. $y =$ __________

(b) shifting $f(x)$ 7 units to the right. $y =$ __________

(c) reflecting $f(x)$ about the y-axis. $y =$ __________

(d) reflecting $f(x)$ about the line $x = -1$. $y =$ __________

3. **(1 pt) pl/setAlgebra28ExpFunctions/srw4_1_33.pg**
Find the exponential function $f(x) = Ca^x$ whose graph goes through the points $(0,5)$ and $(2,20)$.
$a =$ _____,
$C =$ _____.

4. **(1 pt) pl/setAlgebra31LogExpApplications/ur_le_2_12a.pg**
A certain bacteria population is known to grow by a factor of 5 every 30 minutes. Suppose that there are initially 120 bacteria.

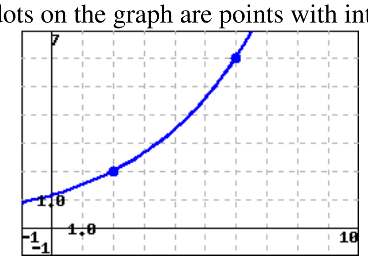
What is the size of the population after t hours? __________

5. **(1 pt) nauLibrary/setExponentialModeling/twoTimes.pg**
The count in a bateria culture is 800 after 17 minutes and 1900 after 38 minutes. Assuming the bacteria count grows exponentially, we can conclude that the population grows by a factor of _____ every 21 minutes, and the population of bacteria after t minutes is $P =$ _______________.

Hint: You may write the population in the form $P = P_0 a^{(t-t_0)/h}$.

6. **(1 pt) nauLibrary/setFunctionBasicGraphs/formulaFromExpGraph.pg**
FORMULA FROM EXPONENTIAL GRAPH

The figure shows the graph of an exponential function. The dots on the graph are points with integer coordinates.



The function graphed is $f(t) =$ _______________.

Hint: The function may be written as $f(t) = y_0 a^{(t-t_0)/h}$, where y_0, t_0, and h, are integers. Note that $f(t+h) = af(t)$ for all t.

7. **(1 pt) pl/setAlgebra31LogExpApplications/srw4_2_2.pg**
The doubling period of a baterial population is 10 minutes. At time $t = 90$ minutes, the baterial population was 90000. What was the initial population at time $t = 0$? __________
Find the size of the baterial population after 4 hours. __________

8. **(1 pt) pl/setAlgebra31LogExpApplications/decay2.pg**
The half-life of Palladium-100 is 4 days. After 16 days a sample of Palladium-100 has been reduced to a mass of 7 mg. What was the initial mass (in mg) of the sample? __________
What is the mass 8 weeks after the start? __________

9. **(1 pt) nauLibrary/setExpLog/expWins.pg**
Compare the functions $f(x) = x^{12}$ and $g(x) = e^x$ by graphing both f and g on your calculator, using several viewing rectangles. When does the graph of g finally surpass the graph of f? The graphs intersect for the last time at $x \approx$ _____ . (Round your answer to four significant figures.)

Hints: To get this much accuracy you can use the intersect feature of your calculator, or make a very narrow x window. You **must** round your answer or it will be marked wrong.

Professor Swift **JSwift_136**

WeBWorK assignment number 04_Inverse_Funcs is due : 02/02/2009 at 02:00am MST.

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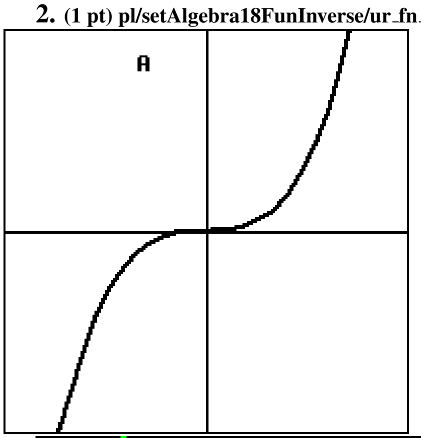
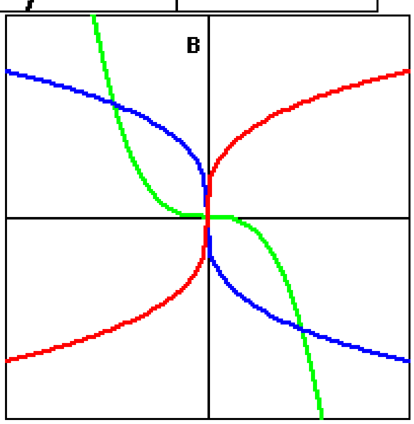
1. **(1 pt) pl/setAlgebra18FunInverse/srw2_10_17.pg**

If f is one-to-one and $f(-13) = 5$, then
$f^{-1}(5) =$ _____
and $(f(-13))^{-1} =$ _____.
If g is one-to-one and $g(5) = 1$, then
$g^{-1}(1) =$ _____
and $(g(5))^{-1} =$ _____.
If h is one-to-one and $h(-1) = 7$, then
$h^{-1}(7) =$ _____
and $(h(-1))^{-1} =$ _____.

---

2. **(1 pt) pl/setAlgebra18FunInverse/ur_fn_4_4.temp.pg**





A function $f(x)$ is graphed in plane A. It is a 1-to-1 function, so it must have an inverse.
Enter the color ("red", "green", or "blue") of its inverse function which is graphed in plane B. Use what you know about the graphs of inverse functions rather than algebraic calculations based on what you might guess the function to be.
Color of f^{-1} graph = _____
Important!! You only have 2 attempts to get this problem right!

---

3. **(1 pt) pl/setAlgebra18FunInverse/srw2_10_7-12a.pg**

Enter a Y (for Yes) or an N (for No) in each answer space below to indicate whether the corresponding function is one-to-one or not.
You must get all of the answers correct to receive credit.

___1. $g(t) = 4t^2 + 7$
___2. $k(x) = \cos x, \quad 0 \leq x \leq \pi$
___3. $h(t) = 4t^2 + 7, \quad t \leq 0$
___4. $f(t) = 2^t$
___5. $h(x) = |x| + 6$
___6. $k(t) = 4\sqrt{t} + 7$

---

4. **(1 pt) pl/setAlgebra18FunInverse/ur_inv_2.pg**

Find the inverse for each of the following functions.

$f(x) = 15x + 4$
$f^{-1}(x) =$ ____________________

$g(x) = 13x^3 - 13$
$g^{-1}(x) =$ ____________________

$$h(x) = \frac{15}{x+13}$$
$h^{-1}(x) =$ ____________________

$j(x) = \sqrt[3]{x+13}$
$j^{-1}(x) =$ ____________________

---

5. **(1 pt) nauLibrary/setInverseFun/numericalInverse.pg**

Find the approximate value of $f^{-1}(1)$ for the function $f(x) = 0.2x + 0.4x^3 + 0.7x^5$.
$f^{-1}(1) =$ _____ .
Hint: Do not try to find $f^{-1}(x)$ for arbitrary x; it's impossible. Use the intersect feature on your calculator or some other technology. Your answer needs to be correct to within one tenth of a percent.

---

6. **(1 pt) pl/setAlgebra29LogFunctions/sw6_3_17.pg**

Evaluate the expression, reduce to simplest form.
(a) $\log_3\left(\frac{1}{81}\right)$
Your answer is ____________

(b) $\log\sqrt[5]{10}$

Your answer is ____________

(c) $\log 0.001$
Your answer is ____________

---

7. **(1 pt) pl/setAlgebra29LogFunctions/sw6_3_19.pg**

Evaluate the expression, reduce to simplest form.
(a) $2^{\log_2 6}$
Your answer is ____________

(b) $10^{\log 2}$
Your answer is ____________

(c) $e^{\ln 2}$
Your answer is ____________

---

8. **(1 pt) pl/setAlgebra29LogFunctions/srw4_2_59.pg**
The domain of the function $g(x) = \log_a(x^2 - 25)$ is
$(-\infty,$ _____ $) \cup ($ _____, $\infty)$.

---

9. **(1 pt) pl/setHagoodPrecalc/expeqn3_a.pg**
Solve for x:

$$x = 3^{5\log_3 4 - \log_3 7}$$

$x =$ _________
Note: Your answer must have no logarithms and no exponential "^" symbols.

---

10. **(1 pt) pl/setAlgebra31LogExpApplications/problem9.pg**
If $\log\ p = x$ and $\log\ q = y$, evaluate the following in terms of x and y:

(a) $\log\ (p^4 q^5) =$ _________

(b) $\log\ \sqrt{p^{-7} q^5} =$ _________

(c) $\log\ \dfrac{p^{-8}}{q^3} =$ _________

(d) $\dfrac{\log\ p^8}{\log\ q^{-4}} =$ _________

(e) $(\log\ p^6)^{-3} =$ _________

---

11. **(1 pt) pl/setAlgebra30LogExpEqns/sw6_5_15.pg**
Find the solution of the exponential equation

$$e^{2x+1} = 35$$

in terms of logarithms, or correct to four decimal places.
$x =$ ____________

---

12. **(1 pt) nauLibrary/setExpLog/WPExp2.pg**
In a certain country, the rate of deforestation is about 3.52% per year. Assume that the amount of forest remaining is given by the function
$F = F_0 e^{-0.0352t}$

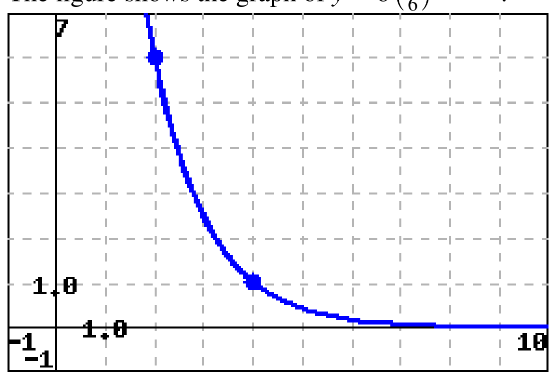
where F_0 is the present acreage of forest land and t is the time in years from the present. In how many years will there be only 40% of the present acreage remaining?
Round your answer to three decimal places.
_________ years from now

---

13. **(1 pt) pl/setAlgebra31LogExpApplications/radioactive_dye_a.pg**
You go to the doctor and he gives you 15 milligrams of radioactive dye. After 24 minutes, 4.5 milligrams of dye remain in your system. To leave the doctor's office, you must pass through a radiation detector without sounding the alarm. If the detector will sound the alarm if more than 2 milligrams of the dye are in your system, how long will your visit to the doctor take, assuming you were given the dye as soon as you arrived? Give your answer to within 0.1 per cent (three or four significant figures).
You will spend _________ minutes at the doctor's office.

---

14. **(1 pt) nauLibrary/setExpLog/a_to_e.pg**
The figure shows the graph of $y = 6\left(\frac{1}{6}\right)^{(t-2)/2}$.



This function can be written as $y = Ce^{kt}$, where
$C =$ ______________ , and $k =$ ______________ .

WeBWorK assignment number 05_Velocity_Limits1 is due : 02/11/2009 at 02:00am MST.

1. **(1 pt) Library/maCalcDB/setAlgebra13Inequalities/p4.pg**
Solve the following inequality. Write the answer in interval notation.
Note: If the answer includes more than one interval write the intervals separated by the "union" symbol, U. If needed enter ∞ as *infinity* and $-\infty$ as *-infinity* .

$$x^2 - 2x - 15 > 0$$

Answer: ______

2. **(1 pt) pl/setAlgebra19FunTransforms/srw2_5_23.pg**
Consider the graph $y = f(x) = |x|$. If you shift the graph to the left 74 units, shrink it vertically by a factor of 93, and then Jim shift it downward 21 units, the new graphs is $y = g(x) =$ ______.

3. **(1 pt) pl/setDerivatives1/ur_dr_1_3.pg**
Let $f(x)$ be the function $\frac{1}{x+4}$. Then the quotient $\frac{f(6+h)-f(6)}{h}$ can be simplified to $\frac{-1}{ah+b}$, provided $h \neq 0$, with:

$a =$ ______ and $b =$ ______ .

4. **(1 pt) pl/setLimitsRates1TangentVelocity/ns_2_1_5.pg**
A ball is thrown into the air by a baby alien on a planet in the system of Alpha Centauri with a velocity of 33 ft/s. Its height in feet after t seconds is given by $y = 33t - 14t^2$.

A. Find the average velocity for the time period beginning when t=1 and lasting

.01 s: ______
.005 s: ______
.002 s: ______
.001 s: ______
NOTE: For the above answers, you may have to enter 6 or 7 significant digits if you are using a calculator.
B. Estimate the instanteneous velocity when t=1.
______

5. **(1 pt) pl/setLimitsRates1TangentVelocity/ns2_1_5b.pg**
Below is an "oracle" function. An oracle function is a function presented interactively. When you type in a t value, and press the –f–> button, the value $f(t)$ appears in the right hand window. There are three lines, so you can easily calculate three different values of the function at one time.

The function $f(t)$ represents the position (mesured in meters) of a particle at time t (measured in seconds).

The velocity of the particle at time 1.4 is approximately ______ meters per second. You need to give an answer accurate to 1 percent.

t	$\rightarrow$	f(t)
Enter t	$\rightarrow$	result: $f(t)$
Enter t	$\rightarrow$	result: $f(t)$
Enter t	$\rightarrow$	result: $f(t)$

Remember this technique for finding velocities. Later we will use the same method to find the derivative of a function.

6. **(1 pt) pl/setLimitsRates1TangentVelocity/s1_1_4.pg**
The point $P(0.2, 25)$ lies on the curve $y = 5/x$. If Q is the point $(x, 5/x)$, find the slope of the secant line PQ for the following values of x.
If $x = 0.3$, the slope of PQ is: ______
and if $x = 0.21$, the slope of PQ is: ______
and if $x = 0.1$, the slope of PQ is: ______
and if $x = 0.19$, the slope of PQ is: ______
Based on the above results, guess the slope of the tangent line to the curve at $P(0.2, 25)$. ______

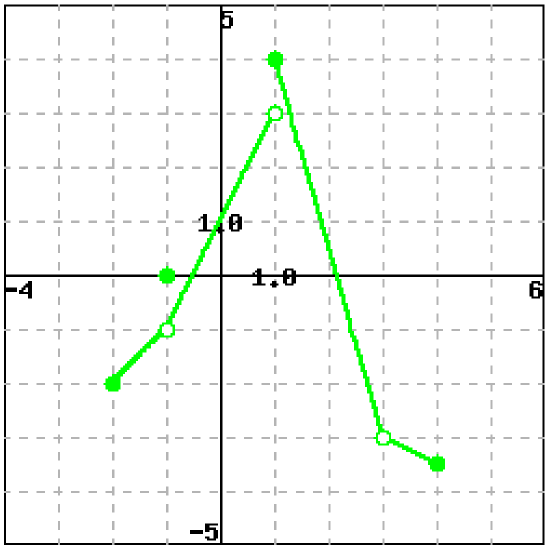
7. **(1 pt) pl/setLimitsRates1TangentVelocity/s2_1_8a.pg**
The position, s, of a cat running from a dog down a dark alley as a function of time, t, is given by the values of the table.

t(seconds)	0	1	2	3	4	5
s(feet)	0	11	43	53	82	103

A. Find the average velocity, v_{ave}, of the cat (in ft/sec) for the time period beginning when t = 2 and lasting
a) 3 sec. $v_{ave} =$ ______
b) 2 sec. $v_{ave} =$ ______
c) 1 sec. $v_{ave} =$ ______

B. Given just this table, it is impossible to compute the instantaneous velocity when t = 2 with certainty. Nevertheless, **estimate** the instantaneous velocity of the cat (in ft/sec) when t = 2 by computing the average velocity on the time interval $[1, 3]$.
$v_{ave} =$ ______

8. **(1 pt) pl/setLimitsRates1_5Graphs/ur_lr_1-5_1.pg**
Let F be the function below.



Evaluate each of the following expressions.

Note: Enter 'DNE' if the limit does not exist or is not defined.

a) $\lim_{x\to -1^-} F(x) =$ ___

b) $\lim_{x\to -1^+} F(x) =$ ___

c) $\lim_{x\to -1} F(x) =$ ___

d) $F(-1) =$ ___

e) $\lim_{x\to 1^-} F(x) =$ ___

f) $\lim_{x\to 1^+} F(x) =$ ___

g) $\lim_{x\to 1} F(x) =$ ___

h) $\lim_{x\to 3} F(x) =$ ___

i) $F(3) =$ ___

9. **(1 pt) pl/setLimitsRates1_5Graphs/ur_lr_1-5_2.pg**

Below is an "oracle" function. An oracle function is a function presented interactively. When you type in an x value, and press the –f–> button, the value $f(x)$ appears in the right hand window. There are three lines, so you can easily calculate three different values of the function at one time.

Determine the one-sided limits of the function f at 2.47, and the value of f at 2.47.

$\lim_{x\to 2.47^-} f(x) =$ ________

$f(2.47) =$ ________

$\lim_{x\to 2.47^+} f(x) =$ ________

Are all of these numbers the same?: (Y or N) ___. If so then the function is **continuous** at 2.47.

x	→	f(x)
Enter x	→	result: $f(x)$
Enter x	→	result: $f(x)$
Enter x	→	result: $f(x)$

10. **(1 pt) pl/setLimitsRates2Limits/s1_3_18calc.pg**

Evaluate the limit by plotting the function on your calculator and finding the y coordinate of the hole at $x = 1.1$. (Use Zoom Decimal so one of the pixels is at exactly $x = 1.1$. Otherwise, you might not see the hole in the graph. You might also need to set Xres = 1 in the Window page, so that the function gets evaluated at every pixel.)

$$\lim_{x\to 1.1} \frac{x^2 - 0.4x - 0.77}{x - 1.1} = \_\_\_$$

1. **(1 pt) pl/setLimitsRates2Limits/s1_3_16a.pg**
Evaluate the limit by factoring the numerator:

$$\lim_{x\to -1} \frac{x^2+3x+2}{x+1} = \_\_\_\_$$

You might also want to look at the graph of the function, but please practice computing the limit with "pencil and paper."

2. **(1 pt) pl/setLimitsRates2Limits/ns_2_3_1.pg**
Let $\lim_{x\to a} h(x) = 2$, $\lim_{x\to a} g(x) = -5$, and $\lim_{x\to a} f(x) = 0$.
Find following limits if they exist. If not, enter DNE ('does not exist') as your answer.

____1. $\lim_{x\to a} h(x)+g(x)$
____2. $\lim_{x\to a} h(x)-g(x)$
____3. $\lim_{x\to a} h(x)*f(x)$
____4. $\lim_{x\to a} \frac{h(x)}{g(x)}$
____5. $\lim_{x\to a} \frac{h(x)}{f(x)}$
____6. $\lim_{x\to a} \frac{f(x)}{h(x)}$
____7. $\lim_{x\to a} \sqrt{g(x)}$
____8. $\lim_{x\to a} g(x)^{-1}$
____9. $\lim_{x\to a} \frac{1}{g(x)-f(x)}$

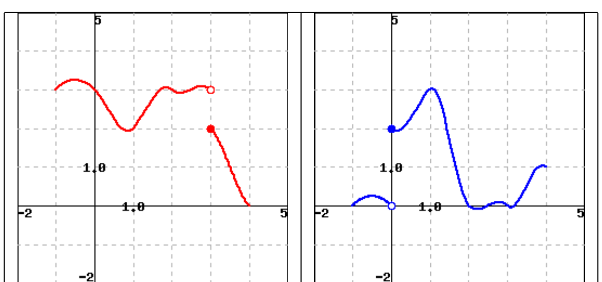
3. **(1 pt) pl/setLimitsRates2Limits/s1_3_36.pg**
Evaluate the limit.

$$\lim_{b\to 9} \frac{\frac{1}{b}-\frac{1}{9}}{b-9} = \_\_\_\_\_\_\_\_$$

4. **(1 pt) pl/setLimitsRates2Limits/s1_3_5.pg**
Evaluate the limit.

$$\lim_{x\to -1} \frac{x-8}{3x^2-6x+7} = \_\_\_\_\_\_$$

5. **(1 pt) pl/setLimitsRates1_5Graphs/ur_lr_1-5_3b.pg**



f(x)	g(x)

The graphs of f and g are given above. Use them to evaluate each quantity below. Write 'DNE' if the limit or value does not exist (or if it's infinity).

____1. $\lim_{x\to 0^+}[f(x)+g(x)]$
____2. $f(3)+g(3)$
____3. $\lim_{x\to 0^-}[f(x)+g(x)]$
____4. $\lim_{x\to 3^-}[f(x)g(x)]$

6. **(1 pt) pl/setLimitsRates2Limits/ur_lr_2_10b.pg**

a	-1	0	1	2	3	4
$\lim_{x\to a^-} f(x)$	DNE	2	2	1	2	0
$\lim_{x\to a^+} f(x)$	1	2	2	1	2	DNE
$f(a)$	1	-1	2	1	2	0
$\lim_{x\to a^-} g(x)$	DNE	3	1	1	0	0
$\lim_{x\to a^+} g(x)$	2	3	0	1	0	DNE
$g(a)$	2	3	1	1	0	0

Using the table above calcuate the limits below.
Enter 'DNE' if the limit doesn't exist OR if limit can't be determined from the information given.

____1. $f(0)+g(0)$
____2. $f(1)+g(1)$
____3. $f(g(0))$
____4. $f(0)/g(0)$

7. **(1 pt) pl/setLimitsRates2Limits/ur_lr_2_11.pg**
If $10x-43 \le f(x) \le x^2+2x-27$ for all x, then
$\lim_{x\to 4} f(x) =$ ________ .
What theorem did you use to arrive at your answer?

____

8. **(1 pt) pl/setLimitsRates2Limits/ur_lr_2_14a.pg**

Let $f(y) = \frac{3}{y-3} - \frac{18}{y^2-9}$.

Note that $\lim_{y\to 3} \frac{3}{y-3}$ does not exist, and $\lim_{y\to 3} \frac{18}{y^2-9}$ does not exist. Nevertheless, $\lim_{y\to 3} f(y)$ exists. You should understand why this does not violate Limit Law 2.

Evaluate the limit by first putting the two fractions over a common denominator.
$\lim_{y\to 3} f(y) =$ ______ .

9. **(1 pt) pl/setLimitsRates2Limits/s1_3_27a.pg**
Evaluate the limit. Hint: rationalize the denominator.

$\lim_{a \to 49} \frac{49 - a}{7 - \sqrt{a}} =$ _______ .

10. **(1 pt) pl/setLimitConcepts/3-2-56.pg**
Evaluate

$$\lim_{h \to 0} \frac{f(-4+h) - f(-4)}{h},$$

where $f(x) = -6x^2 + 4$.

If the limit does not exist enter DNE.

Limit = ___________

1. **(1 pt) pl/setAlgebra29LogFunctions/srw4_3_45a.pg**
Rewrite the expression

$$\ln 10 + 6\ln x + 3\ln(x^2+10)$$

as a single logarithm. That is, find the function $f(x)$ such that

$$\ln 10 + 6\ln x + 3\ln(x^2+10) = \ln(f(x)).$$

$f(x) =$ ____________

2. **(1 pt) pl/setLimitsRates3Infinite/s3_5_3.pg**
Evaluate the limit.
$\lim_{x\to\infty} \frac{6x+10}{5x^2-10x+3} =$ _______ .

3. **(1 pt) pl/setLimitsRates3Infinite/s3_5_4.pg**
Evaluate the limit.
$\lim_{x\to\infty} \frac{3x^3-11x^2-7x}{7-11x-11x^3} =$ _______ .

4. **(1 pt) pl/setLimitsRates3Infinite/s3_5_5.pg**
Evaluate the limit.
$\lim_{x\to\infty} \frac{(10-x)(6+10x)}{(3-10x)(8+9x)} =$ _______ .

5. **(1 pt) pl/setLimitsRates3Infinite/s3_5_11.pg**
Evaluate the limit.
$\lim_{x\to\infty} \frac{\sqrt{7+8x^2}}{(11+8x)} =$ _______ .

6. **(1 pt) pl/setLimitsRates3Infinite/ur_lr_3_13.pg**

Evaluate the following limits. If needed, enter INF for ∞ and MINF for $-\infty$.
(a) $\lim_{x\to\infty} \left(\sqrt{x^2-6x+1}-x\right) =$ _____ .
(b) $\lim_{x\to-\infty} \left(\sqrt{x^2-6x+1}-x\right) =$ _____ .

7. **(1 pt) pl/setContinuity/4-1-23.pg**
Let

$$f(x) = \frac{3}{x+2}.$$

Find each point of discontinuity of f, and for each give the value of the point of discontinuity and evaluate the indicated one-sided limits.
NOTE: Use 'INF' for ∞ and '-INF' for $-\infty$.
If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

Point 2: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

Point 3: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

8. **(1 pt) pl/setContinuity/4-1-28.pg**
Let

$$f(x) = \frac{x^2+9}{9-x^2}.$$

Find each point of discontinuity of f, and for each give the value of the point of discontinuity and evaluate the indicated one-sided limits.
NOTE: Use 'INF' for ∞ and '-INF' for $-\infty$.
If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

Point 2: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

Point 3: $C =$ _____
$\lim_{x\to C^-} f(x) =$ _____
$\lim_{x\to C^+} f(x) =$ _____

9. **(1 pt) pl/setLimitsRates3Infinite/ur_lr_3_15.pg**

A function is said to have a **vertical asymptote** wherever the limit on the left or right (or both) is either positive or negative infinity.
For example, the function $f(x) = \frac{x^2-4}{(x-3)^2}$ has a vertical asymptote at $x = 3$.

For each of the following limits, enter either 'P' for positive infinity, 'N' for negative infinity, or 'D' when the limit simply does not exist.

$\lim_{x \to 3^-} \frac{x^2-4}{(x-3)^2} =$___

$\lim_{x \to 3^+} \frac{x^2-4}{(x-3)^2} =$___

$\lim_{x \to 3} \frac{x^2-4}{(x-3)^2} =$ ___

---

10. **(1 pt) pl/setLimitsRates3Infinite/ur_lr_3_16.pg**

A function is said to have a **vertical asymptote** wherever the limit on the left or right (or both) is either positive or negative infinity.

For example, the function $f(x) = \frac{x^2+1}{x^2-10x+25}$ has a vertical asymptote at $x = 5$.

For each of the following limits, enter either 'P' for positive infinity, 'N' for negative infinity, or 'D' when the limit simply does not exist.

$\lim_{x \to 5^-} \frac{x^2+1}{x^2-10x+25} =$___

$\lim_{x \to 5^+} \frac{x^2+1}{x^2-10x+25} =$___

$\lim_{x \to 5} \frac{x^2+1}{x^2-10x+25} =$ ___

---

11. **(1 pt) pl/setContinuity/4-1-25.pg**

Let

$$f(x) = \frac{x^2+2}{x^2-9}.$$

Find the indicated one-sided limits of f.

NOTE: Remember that you use 'INF' for ∞ and '-INF' for $-\infty$.

You should also sketch a graph of $y = f(x)$, including vertical and horizontal asymptotes.

$\lim_{x \to -3^-} f(x) =$ ______________

$\lim_{x \to -3^+} f(x) =$ ______________

$\lim_{x \to 3^-} f(x) =$ ______________

$\lim_{x \to 3^+} f(x) =$ ______________

$\lim_{x \to -\infty} f(x) =$ ______________

$\lim_{x \to \infty} f(x) =$ ______________

---

12. **(1 pt) pl/setContinuity/4-1-29.pg**

Let

$$f(x) = \frac{x^2-2x-15}{x^2+8x+15}.$$

Find the indicated one-sided limits of f.

NOTE: Remember that you use 'INF' for ∞ and '-INF' for $-\infty$.

You should also sketch a graph of $y = f(x)$, including vertical and horizontal asymptotes.

$\lim_{x \to -5^-} f(x) =$ ______________

$\lim_{x \to -5^+} f(x) =$ ______________

$\lim_{x \to -3^-} f(x) =$ ______________

$\lim_{x \to -3^+} f(x) =$ ______________

$\lim_{x \to -\infty} f(x) =$ ______________

$\lim_{x \to \infty} f(x) =$ ______________

1. **(1 pt) pl/setLimitsRates2Limits/ur_lr_2_7.pg**

Let $f(x) = \frac{x^2-7x+10}{x^2+3x-10}$.
Calculate $\lim_{x\to 2} f(x)$ by first finding a continuous function which is equal to f everywhere except $x = 2$.
$\lim_{x\to 2} f(x) =$ ______

2. **(1 pt) pl/setLimitConcepts/3-2-56.pg**
Evaluate

$$\lim_{h\to 0} \frac{f(-3+h)-f(-3)}{h},$$

where $f(x) = -7x^2+6$.
If the limit does not exist enter DNE.
Limit = ______

3. **(1 pt) pl/setContinuity/4-1-23justPoints.pg**
Let

$$f(x) = \frac{8}{x+7}.$$

Find the number(s) a such that f is not continuous at $x = a$.

If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $a =$ ____
Point 2: $a =$ ____
Point 3: $a =$ ____

4. **(1 pt) pl/setContinuity/4-1-28justPoints.pg**
Let

$$f(x) = \frac{x^2+1}{1-x^2}.$$

Find the number(s) a such that f is not continuous at $x = a$.

If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $a =$ ____
Point 2: $a =$ ____
Point 3: $a =$ ____

5. **(1 pt) pl/setContinuity/4-1-31justPoints.pg**
Let

$$f(x) = \frac{4x-8}{x^4-12x^3+36x^2}.$$

Find the number(s) a such that f is not continuous at $x = a$.

If you have more than one point, give them in numerical order, from smallest to largest.
If you have extra boxes, fill each in with an 'x'.

Point 1: $a =$ ____
Point 2: $a =$ ____
Point 3: $a =$ ____

6. **(1 pt) pl/setContinuity/4-1-54.pg**
Let

$$f(x) = \begin{cases} 3x, & x \le 1, \\ x^2, & x > 1. \end{cases}$$

Find the indicated one-sided limits of f, and determine the continuity of f at the indicated point.
NOTE: Type DNE if a limit does not exist.
You should also sketch a graph of $y = f(x)$, including hollow and solid circles in the appropriate places.
$\lim_{x\to 1^-} f(x) =$ ______
$\lim_{x\to 1^+} f(x) =$ ______
$\lim_{x\to 1} f(x) =$ ______
$f(1) =$ ______

Is f continuous at $x = 1$? (YES/NO) ______

7. **(1 pt) pl/setContinuity/4-1-55.pg**
Let

$$f(x) = \begin{cases} 1+x, & x < 1, \\ 3-x, & x \ge 1. \end{cases}$$

Find the indicated one-sided limits of f, and determine the continuity of f at the indicated point.
NOTE: Type DNE if a limit does not exist.
You should also sketch a graph of $y = f(x)$, including hollow and solid circles in the appropriate places.
$\lim_{x\to 1^-} f(x) =$ ______
$\lim_{x\to 1^+} f(x) =$ ______
$\lim_{x\to 1} f(x) =$ ______
$f(1) =$ ______

Is f continuous at $x = 1$? (YES/NO) ______

8. **(1 pt) pl/setLimitsRates5Continuity/ur_lr_5_6.pg**

Let $f(x) = \begin{cases} 2x-2, & \text{if } x \le 5 \\ -6x+b, & \text{if } x > 5 \end{cases}$

If $f(x)$ is a function which is continuous everywhere, then we must have

$b =$_______

Now for fun, try to graph $f(x)$.

9. **(1 pt) pl/setLimitsRates5Continuity/ur_lr_5_6b.pg**

Let $f(x) = \begin{cases} mx-10, & \text{if } x < -2 \\ x^2+7x-8, & \text{if } x \ge -2 \end{cases}$

If $f(x)$ is a function which is continuous everywhere, then we must have

$m =$_______

Now for fun, try to graph $f(x)$.

10. **(1 pt) pl/setLimitsRates5Continuity/ur_lr_5_4.pg**

A function $f(x)$ is said to have a **jump** discontinuity at $x = a$ if:

1. $\lim_{x\to a^-} f(x)$ exists.

2. $\lim_{x\to a^+} f(x)$ exists.

3. The left and right limits are not equal.

Let $f(x) = \begin{cases} 3x-6, & \text{if } x < 9 \\ \frac{5}{x+5}, & \text{if } x \ge 9 \end{cases}$

Show that $f(x)$ has a jump discontinuity at $x = 9$ by calculating the limits from the left and right at $x = 9$.

$\lim_{x\to 9^-} f(x) =$_______

$\lim_{x\to 9^+} f(x) =$_______

Now for fun, try to graph $f(x)$.

---

1. (1 pt) pl/setLimitsRates6Rates/c1s1p2a.pg

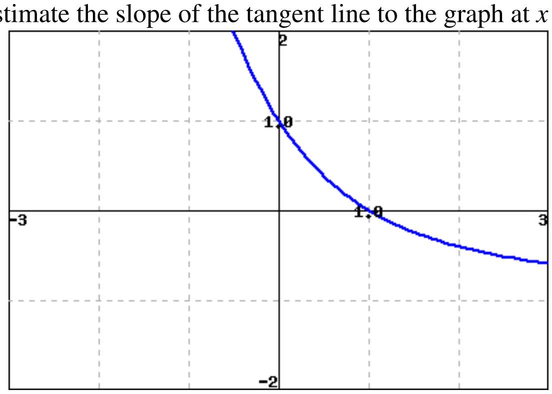
Let $p(x) = 5.7 \cdot x^{1.8}$. Use a calculator or computer to find the slope of the tangent line to $y = p(x)$ at the point $(2.1, p(2.1))$.

$m =$ ________________. Give the slope accurate to the nearest thousandth.

---

2. (1 pt) nauLibrary/setCalcI/slope_from_graph.pg

Estimate the slope of the tangent line to the graph at $x = 1$.



The slope is approximately ___ . (Your answer needs to be within 0.05 of the true slope to be correct. So, rounding your answer to the nearest tenth is sufficient.)

---

3. (1 pt) pl/setDerivativeFunction/s1_6_8a.pg

The slope of the tangent line to the parabola $y = 4x^2 - 3x + 4$ at the point $(1,5)$ is: __________

The equation of this tangent line can be written in the form $y = m(x-1) + y_0$

where $m =$ __________

and $y_0 =$ __________ .

---

4. (1 pt) pl/setSwiftCalc/setDerivativeFunctions2_1_7.pg

If $f(x) = 4 + 4x - 3x^2$, find an equation of the line tangent to the curve $y = f(x)$ at $x = 5$.

The tangent line is $y =$ ____________________

---

5. (1 pt) pl/setLimitsRates6Rates/s1_6_14.pg

The displacement (in meters) of a particle moving in a straight line is given by $s = 4t^3$ where t is measured in seconds. Find the average velocity of the particle over the time interval $[7,9]$.

____

Find the (instantaneous) velocity of the particle when $t = 7$.

____

---

6. (1 pt) pl/setDerivativeFunction/s2_1_26.pg

If $f(x) = \frac{2}{x^2}$, find $f'(2)$.

____

---

7. (1 pt) pl/setDerivativeFunction/ns2_7_4.pg

If the tangent line to $y = f(x)$ at (3, 10) passes through the point (-5, 1), find

A. $f(3) =$ __________

B. $f'(3) =$ __________

---

8. (1 pt) pl/setDerivativeFunction/3-3-05.pg

Suppose that

$$f(x+h) - f(x) = 7hx^2 + 3hx + 4h^2x + 6h^2 - 8h^3.$$

Find $f'(x)$.

$f'(x) =$ ____________

---

9. (1 pt) pl/setDerivativeFunction/3-3-25.pg

Let $f(x) = \frac{-1}{4x+6}$. Then the expression

$$\frac{f(x+h) - f(x)}{h}$$

can be written in the form

$$\frac{A}{(Bx + Ch + 6)(Dx + 6)},$$

where A, B, C, and D are constants. (Note: It's possible for one or more of these constants to be 0.) Find the constants.

$A =$ _____

$B =$ _____

$C =$ _____

$D =$ _____

Use your answer from above to find $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$.

$\lim_{h \to 0} \frac{f(x+h) - f(x)}{h} =$ __________

Finally, find each of the following:

$f'(1) =$ _____

$f'(2) =$ _____

$f'(3) =$ _____

---

10. (1 pt) pl/setDerivativeFunction/3-3-23.pg

Let $f(x) = 5\sqrt{x} - 5$. Then the expression

$$\frac{f(x+h) - f(x)}{h}$$

can be written in the form

$$\frac{A}{(\sqrt{Bx + Ch}) + (\sqrt{x})},$$

where A, B, and C are constants. (Note: It's possible for one or more of these constants to be 0.) Find the constants.

$A =$ _____

$B =$ _____

$C =$ _____

Use your answer from above to find $\lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$.

$$\lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = \_\_\_\_\_\_$$

Finally, find each of the following:
$f'(1) =$ ____
$f'(2) =$ ____
$f'(3) =$ ____

---

11. **(1 pt) pl/setDerivativeFunction/3-3-35.pg**
Suppose that $f(x) = -6x^2 + 8x$.

(A) Find $f'(x)$.
$f'(x) =$ ______

Find the slope of the tangent lines to the graph of f at each of the following values of x:

(B) Slope at $x = 3$: ______

(C) Slope at $x = 5$: ______

(D) Slope at $x = 8$: ______

---

12. **(1 pt) nauLibrary/setCalcI/d_exp_from_def.pg**
The definition of the derivative, applied to $f(x) = 4^x$, results in the formula $f'(x) = k * 4^x$ where

$$k = \lim_{h\to 0} \frac{4^h - 1}{h}.$$

The value k cannot be determined using the usual tricks for evaluating limits. Using your calculator, approximate the constant k, rounded to three significant figures. $k \approx$ ____ .

---

13. **(1 pt) pl/setDerivativeFunction/ns2_8_10.pg**
Let

$$f(x) = -2x^3 - 5x + 5$$

Use the definition of the derivative to calculate the derivative of f:
$f'(x) =$ ________.

Use the definition of the derivative to calculate the derivative of f' (i.e. the second derivative of f):
$f''(x) =$ ________.

WeBWorK just looks at the answer, but on exams you will be tested on your syntax. As you do this problem, and during exams, be sure to write ”lim” where it is needed.

WeBWorK assignment number 10_Der_Poly_Exp is due : 03/04/2009 at 02:00am MST.

---

1. **(1 pt) pl/setDerivatives2Formulas/s2_2_1.pg**

Let f be defined by $f(x) = 3x^2 - 3x - 33$.

$f'(x) =$ ______________ .

$f'(5) =$ ______________ .

---

2. **(1 pt) pl/setDerivatives2Formulas/ur_dr_2_2.pg**

$\frac{d}{dx}(9e^x - 6x^4 + 29) =$ ______________ .

---

3. **(1 pt) pl/setDerivatives2Formulas/s2_2_7.pg**

If $f(t) = 2t^{-3}$, then $f'(t) =$ ______

and $f'(2) =$ ____ .

---

4. **(1 pt) pl/setDerivatives2Formulas/d2a.pg**

Let $f(x) = -3e^{x+1} + e^{-2}$.

$f'(x) =$ ______

[NOTE: A small algebraic manipulation is needed first to get $f(x)$ into a form so that the derivative can be taken.]

---

5. **(1 pt) pl/setDerivatives2Formulas/s2_2_22b.pg**

If $f(x) = 7 + \frac{3}{x} + \frac{4}{x^2}$, then $f'(x) =$ ________ .

---

6. **(1 pt) pl/setDerivatives2Formulas/s2_2_17.pg**

If $f(x) = \sqrt{3x}$, then $f'(x) =$ ______ .

Therefore, $f'(3) =$ ______ .

---

7. **(1 pt) pl/setDerivatives2Formulas/s2_2_11b.pg**

Let $f(x) = 2x^6\sqrt{x} + \frac{2}{x^2\sqrt{x}}$.

$f'(x) =$ ____________ .

---

8. **(1 pt) pl/setDerivatives2Formulas/s2_2_15b.pg**

$\frac{d}{dx}\left(\frac{2x^2 + 8x + 2}{\sqrt{x}}\right) =$ ______________ .

---

9. **(1 pt) pl/setDerivatives2Formulas/s2_2_33a.pg**

If $f(x) = \frac{6x^3 - 8}{x^4}$, find $f'(x)$.

$f'(x) =$ ________.

---

10. **(1 pt) pl/setDerivatives13Higher/s2_7_10a.pg**

Let $h(t) = 4t^{3.2} - 4t^{-3.2}$. Then
$h'(t) =$ ________ , and
$h''(t) =$ ________ .

---

11. **(1 pt) pl/setDerivatives13Higher/ur_dr_13_2f.pg**

$\frac{d}{dx}(6x^4 - 8e^x) =$ ________ .

$\frac{d^2}{dx^2}(6x^4 - 8e^x) =$ ________ .

---

12. **(1 pt) pl/setDerivatives13Higher/ur_dr_13_6.pg**

If $g(t) = 2t^4 - 3t^2 + 5$ evaluate g and its first 5 derivatives at 0.
$g(0) =$ ____ .
$g'(0) =$ ____ .
$g''(0) =$ ____ .
$g'''(0) =$ ____ .
$g^{(4)}(0) =$ ____ .
$g^{(5)}(0) =$ ____ .

---

13. **(1 pt) pl/setDerivatives1_5Tangents/ur_dr_1_5_14.pg**

Given

$$f(x) = x + \sqrt{x}$$

Calculate the tangent line to $y = f(x)$ at the point $(1, 2)$.
$y =$ __$(x-1) + 2$

---

14. **(1 pt) nauLibrary/setCalcI/quadraticTanLine.pg**

Let f be defined by $f(x) = x^2 + 2x + 3$.

$f'(x) =$ ______ .

An equation for the tangent line to $y = f(x)$ at $x = 4$ is
$y =$ ________ .

---

15. **(1 pt) nauLibrary/setCalcI/quadraticTanLine_a.pg**

Let f be defined by $f(x) = -3x^2 + 1$, and let a be any constant.

$f(a) =$ ______ and $f'(a) =$ ______ . (These two answers will depend on the constant a.)

An equation for the tangent line to $y = f(x)$ at $x = a$ is
$y =$ __________ . (This answer will depend on the variable x and the constant a.)

---

16. **(1 pt) pl/setDerivatives1_5Tangents/ur_dr_1_5_8.pg**

The parabola $y = x^2 + 7$ has two tangents which pass through the point $(0, -6)$. One is tangent to the parabola at $(A, A^2 + 7)$ and the other at $(-A, A^2 + 7)$. Find the (positive) number A.
$A =$ ______

---

17. **(1 pt) pl/setDerivatives1_5Tangents/ur_dr_1_5_9.pg**

The graph of $f(x) = 2x^3 + 9x^2 - 60x + 18$ has two horizontal tangents. One occurs at a negative value of x and the other at a positive value of x. What is the negative value of x where a horizontal tangent occurs? __
What is the positive value of x where a horizontal tangent occurs? __

WeBWorK assignment number 11_Product_Quot is due : 03/06/2009 at 02:00am MST.

---

1. **(1 pt) pl/setDerivatives2Formulas/ns3_2_4a.pg**
Find the derivative of the function

$$g(x) = (5x^2 - 5x + 5)e^x$$

$g'(x) =$ ______

It is often important in calculus to factor your derivatives as much as possible. You might have written g' as a sum of two terms. The next part forces you to write it as a simplified factor of two terms.

The answer can be written as $g'(x) = (Ax^2 + Bx + C)e^x$, where $A =$ ___, $B =$ ___, and $C =$ ___.

---

2. **(1 pt) pl/setDerivatives2Formulas/ns3_2_5.pg**
Find the derivative of the function

$$g(x) = \frac{e^x}{1-2x}$$

$g'(x) =$ ______

---

3. **(1 pt) pl/setDerivatives2Formulas/s2_2_13b.pg**
Use the product rule to differentiate $f(t) = (-3t^2 - t - 5)(4t^2 + 8t)$.

$f'(t) =$ ______ .
Note: For this problem you may write the answer as a sum of two terms, as given by the product rule, and you do not need to simplify the expression.

---

4. **(1 pt) pl/setDerivatives2Formulas/s2_2_11new.pg**
$\frac{d}{dx}\left(\frac{2x+4}{3x+5}\right) =$ ______ .

---

5. **(1 pt) pl/setDerivatives1/c1s5p8b.pg**
Constructing new functions from old ones and calculating the derivative of the new function from the derivatives of the old functions:
From the table below calculate the quantities asked for:

x	35	67	1	3
$f(x)$	44099	305251	1	35
$g(x)$	87043	606147	3	67
$f'(x)$	3745	13601	5	33
$g'(x)$	7422	27070	10	62

______ $= (f-g)'(3)$
______ $= (f+g)'(3)$
______ $= (fg)(1)$
______ $= (fg)'(3)$

---

6. **(1 pt) pl/setDerivatives1_5Tangents/ur_dr_1_5_7a.pg**
Let $f(x) = \frac{-2x}{x^2+1}$. The derivative of f is $f'(x) =$ ______ .

So, $f(-1) =$ ___ and $f'(-1) =$ ___ . Use this to find an equation of the tangent line to the curve $y = f(x)$ at $x = -1$

$y =$ ______ .

---

7. **(1 pt) pl/setDerivatives2Formulas/ur_dr_2_1b.pg**
Given

$$f(x) = \frac{x^2}{x^2+8},$$

the derivative function can be simplified to

$$f'(x) = \frac{Ax^2 + Bx + C}{(x^2 + D)^2},$$

where $A =$ ___, $B =$ ___, $C =$ ___, and $D =$ ___.

---

8. **(1 pt) pl/setDerivatives2Formulas/d3.pg**

Given that

$$f(x) = x^{12}h(x)$$
$$h(-1) = 2$$
$$h'(-1) = 5$$

it follows that $f'(-1) =$ ______

[HINT: Use the product rule and the power rule.]

---

9. **(1 pt) pl/setDerivatives2Formulas/s2_2_11a.pg**

Let $f(x) = \frac{5}{6x+6}$.

$f'(x) =$ ______

---

10. **(1 pt) nauLibrary/setCalcI/hzntl_quot_rule.pg**
The graph $y = \frac{-7x-1}{e^x}$ has a horizontal tangent at $x =$ ___ .

---

11. **(1 pt) nauLibrary/setCalcI/producte2x.pg**
Use the product rule to differentiate.
$\frac{d}{dx}(e^{2x}) = \frac{d}{dx}(e^x \cdot e^x) =$ ______ .
Now, use the product rule again to differentiate.
$\frac{d}{dx}(e^{3x}) = \frac{d}{dx}(e^x \cdot e^{2x}) =$ ______ .

12. **(1 pt) nauLibrary/setCalcI/secondDerProduct.pg**
Let $f(x) = (5x^2 - 4x - 1)e^x$. Compute the following derivatives.

$f'(x) =$ ______________ . Simplify this before finding the second derivative.

$f''(x) =$ ______________ .

WeBWorK assignment number 12_Der_Trig_Funcs is due : 03/09/2009 at 02:00am MST.

1. **(1 pt) pl/setDerivatives4Trig/s2_4_7.pg**
Evaluate $\lim_{x\to 0} \frac{\sin 3x}{6x} =$ _____ .

Hint: You may use the fact, proved in the book, that $\lim_{x\to 0} \frac{\sin x}{x} = 1$.

2. **(1 pt) nauLibrary/setTrigIdentity/Identity01.pg**
Write each expression in terms of sines and/or cosines and then simplify.
$\sec(x)\cos(x)$ = _______
$\sin(x)\csc(x)$ = _______
$\cot(x)\sin(x)$ = _______

3. **(1 pt) nauLibrary/setCalcI/trigTanLines.pg**
In this problem, please evaluate the trig functions without a calculator and do not use a decimal point in your answer.

An equation of the tangent line to the curve $y = \sin(x)$ at $x = 3\pi/4$ is
$y =$ ___ + ___ $\cdot(x - 3\pi/4)$.

An equation of the tangent line to the curve $y = \cos(x)$ at $x = \pi/6$ is
$y =$ ___ + ___ $\cdot(x - \pi/6)$.

4. **(1 pt) pl/setDerivatives4Trig/s2_4_21a.pg**
Let $f(x) = 2\sin x + 7\cos x$. Evaluate
$f'(x) =$ ______________
$f'(-\frac{\pi}{6}) =$ ______________

5. **(1 pt) pl/setDerivatives4Trig/s2_4_20f.pg**
If $f(x) = \cos x - 7\tan x$, then
$f'(x) =$ ______________

6. **(1 pt) pl/setDerivatives4Trig/s2_4_24f.pg**
If

$$f(x) = \frac{3\sin x}{1+\cos x}$$

then $f'(x) =$ ____________________

7. **(1 pt) pl/setDerivatives3WordProblems/s2_7_41_noChainRule.pg**
A mass attached to a vertical spring has position function given by $s(t) = 2\sin(t)$ where t is measured in seconds and s in inches. This is an example of simple harmonic motion.
Find the velocity at $t = 1$.
$v(1) =$ ________ inches per second.
Find the acceleration at $t = 1$.
$a(1) =$ ________ inches per second per second.

8. **(1 pt) pl/setDerivatives4Trig/s2_7_32.pg**
Find the 50th derivative of $f(x) = \sin(x)$ by finding the first few derivatives and observing the pattern that occurs.
$f^{(50)}(x) =$ _____

9. **(1 pt) pl/setDerivatives4Trig/ur_dr_4_1a.pg**
Let $f(x) = \frac{8\sin x}{4\sin x + 6\cos x}$.
Then $f'(x) =$ ________________.
An equation of the tangent line to $y = f(x)$ at $x = 0$ is
$y =$ ____________________.

10. **(1 pt) pl/setDerivatives4Trig/s2_4_34.pg**
Find the equation of the tangent line to the curve $y = 2\sec x - 4\cos x$ at the point $(\pi/3, 2)$. The equation of this tangent line can be written in the form $y = mx + b$ where m is: ________
and where b is: ________

1. **(1 pt) pl/setAlgebra17FunComposition/sw4_7_45.pg**
Express the function $h(x) = (x+9)^5$ in the form $f \circ g$. If $f(x) = x^5$, find the function $g(x)$.
Your answer is $g(x)$= _______,

2. **(1 pt) nauLibrary/setCalcI/chainLeibnitz.pg**
Suppose $y = \sin(-x^2 + 5x - 1)$. We can write $y = \sin(u)$, where $u =$ _______ . The Leibnitz notation for the chain rule is $\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$. The factors are $\frac{dy}{du} =$ _____ (written as a function of u) and $\frac{du}{dx} =$ _____ . Now substitue in the function of x for u to get

$\frac{dy}{dx} =$ ___________ (written as a function of x).

3. **(1 pt) pl/setDerivatives5ChainRule/s2_5_2.pg**
Let
$$f(x) = (x^3 + 4x + 3)^4$$
$f'(x) =$ __________________
$f'(4) =$ __________________

4. **(1 pt) pl/setDerivatives5ChainRule/s2_5_4a.pg**
If $f(x) = \sin(x^3)$, then $f'(x) =$ _________ .

5. **(1 pt) pl/setDerivatives5ChainRule/s2_5_5a.pg**
$\frac{d}{dx} \sin^2 x =$ _____________ .

6. **(1 pt) pl/setDerivatives5ChainRule/ur_dr_5_14.pg**
Let
$$f(x) = \cos(5x - 9)$$
$f'(x) =$ _____________

7. **(1 pt) pl/setDerivatives5ChainRule/s2_5_8a.pg**
Let
$$f(x) = \sqrt{3x^2 + 2x + 2}$$
$f'(x) =$ __________________
The curve $y = f(x)$ has a horizontal tangent at $x =$ _____ .

8. **(1 pt) pl/setDerivatives5ChainRule/s2_5_7.pg**
If $f(x) = \tan 4x$, find $f'(x)$ and $f'(5)$.

$f'(x) =$ ______________________ .

$f'(5) =$ ______________________ .

9. **(1 pt) pl/setDerivatives5ChainRule/ur_dr_5_18a.pg**
$\frac{d}{dx}\left(3e^{x \sin x}\right) =$ _____________

10. **(1 pt) pl/setDerivatives5ChainRule/s2_5_3.pg**
If $f(x) = (3x+8)^{-4}$, then
$f'(x) =$ _____________ , and

$f'(2) =$ _____________

11. **(1 pt) pl/setDerivatives5ChainRule/ur_dr_5_17.pg**
Let
$$f(x) = -6\sin(\cos(x^7))$$
$f'(x) =$ _____________

12. **(1 pt) pl/setDerivatives5ChainRule/derchr2.pg**

Let $F(x) = f(f(x))$ and $G(x) = (F(x))^2$. You also know that $f(3) = 10, f(10) = 2, f'(10) = 6, f'(3) = 12$.
Find $F'(3) =$ _____ and $G'(3) =$ _____.

13. **(1 pt) nauLibrary/setCalcI/chainrule1.pg**
Let
$$f(x) = e^{3x^2 - 3x - 5}.$$
The derivative of f is $f'(x) =$ __________________.
An equation for the tangent line to the curve $y = f(x)$ at $x = -2$ is
$y =$ ______________________.

14. **(1 pt) pl/setDerivatives3WordProblems/s2_7_41a.pg**
A mass attached to a vertical spring has position function given by $s(t) = 5\sin(4t + 0.4) + 3$ where t is measured in seconds and s in inches. This is an example of simple harmonic motion.
Find the velocity at time t.
$v(t) =$ _________ inches per second.
Find the acceleration at time t.
$a(t) =$ _________ inches per second per second.

15. **(1 pt) pl/setDerivatives1/c1s5p8c.pg**
This problem tests calculating new functions from old ones:
From the table below calculate the quantities asked for:

x	136	21	7	-2	-4	20
$f(x)$	18361	421	43	7	21	381
$g(x)$	-5031184	-18564	-700	20	136	-16040
$f'(x)$	271	41	13	-5	-9	39
$g'(x)$	-110978	-2648	-296	-26	-98	-2402

_________ $= (g \circ f)'(-2)$.
_________ $= (f \circ f)(-2)$.
_________ $= (f \circ f)'(-4)$.

16. **(1 pt) nauLibrary/setCalcI/gaussian.pg**
Let $f(x) = e^{-3x^2}$. Then, $f''(x) =$ ___________. The solutions to $f''(x) = 0$ are $x = \pm$ _______.

WeBWorK assignment number 14_Implicit_Diff is due : 03/26/2009 at 02:00am MST.

---

1. **(1 pt) nauLibrary/setCalcI/implicit1pretty.pg**
Use implicit differentiation to find the derivative of the family of curves

$$\sin(xy)+x^4+y^4=c.$$

$\frac{dy}{dx}=$ ______________________________.

Note: your answer will be a function of x and y. If you take differential equations, you will learn how to get the family of curves starting with the formula for $\frac{dy}{dx}$.

---

2. **(1 pt) pl/setDerivatives2_5Implicit/s2_6_19c.pg**
Use implicit differentiation to find the slope of the tangent line to the curve $xy^3+xy=8$ at the point $(4,1)$.

The slope of the tangent line is _____, so an equation of the tangent line is

$y=$ ______________ .

---

3. **(1 pt) pl/setDerivatives2_5Implicit/c2s6p2a.pg**
Use implicit differentiation to find the slope of the tangent line to the curve

$$4x^2-2xy-2y^3=70$$

at the point $(-4,1)$.
$m=$ __________

---

4. **(1 pt) pl/setDerivatives2_5Implicit/c2s6p3.pg**
Find the slope of the tangent line to the curve $xy^3+3y-2=0$ at the point $(-0.3,0.7)$.
$m=$ ______________

---

5. **(1 pt) pl/setDerivatives2_5Implicit/c2s6p1.pg**
Find the slope of the tangent line to the curve

$$\sqrt{x+2y}+\sqrt{4xy}=\sqrt{5}+\sqrt{8}$$

at the point $(1,2)$.
$\left.\frac{dy}{dx}\right|_{(1,2)}=$ ________________________ .

---

6. **(1 pt) pl/setDerivatives2_5Implicit/s2_6_1a.pg**
The equation $-3x^2+2x+xy=5$ can be solved to obtain y as an explicit function of x. You do not need to find this explicit function $y(x)$ in this problem. Using the fact that $y(5)=14$, find $y'(5)$ by implicit differentiation.

$y'(5)=$ ______________ .

---

7. **(1 pt) pl/setDerivatives2_5Implicit/s2_6_14.pg**
Find y' by implicit differentiation. Match the expressions defining y implicitly with the letters labeling the expressions for y'.

___1. $5x\sin y+6\sin 2y=2\cos y$
___2. $5x\sin y+6\cos 2y=2\cos y$
___3. $5x\cos y+6\cos 2y=2\sin y$
___4. $5x\cos y+6\sin 2y=2\sin y$

A. $y'=\frac{5\cos y}{5x\sin y+12\sin 2y+2\cos y}$
B. $y'=-\frac{5\sin y}{5x\cos y+12\cos 2y+2\sin y}$
C. $y'=\frac{5\cos y}{5x\sin y-12\cos 2y+2\cos y}$
D. $y'=\frac{5\sin y}{12\sin 2y-5x\cos y-2\sin y}$

---

8. **(1 pt) pl/setDerivatives2_5Implicit/s2_6_25.pg**
Find the equation of the tangent line to the curve (a lemniscate) $2(x^2+y^2)^2=25(x^2-y^2)$ at the point $(3,-1)$. The equation of this tangent line can be written in the form $y=mx+b$ where m is: ______________
and where b is: ______________

---

9. **(1 pt) pl/setSwift/setDerivativesAbs_prob1.pg**
Let

$$f(x)=e^{-6|x|}.$$

Note the absolute value. Use abs(x) for the absolute value of x when entering your answer.
The derivative of f is $f'(x)=$ ___________________

---

10. **(1 pt) pl/setSwift/setDerivativesAbs_prob2.pg**
Let

$$y=|x^2+4x-4|.$$

Note the absolute value. Use abs(x) for the absolute value of x when entering your answer.
$y'=$ ___________________

1. **(1 pt) pl/setSwift/setTrig06Inverses_srw7_4_35.pg**
Find the exact value of each expression by sketching a triangle:
(a) $\cos(\arctan 2) =$ _____.
(b) $\tan(\arccos \frac{1}{\sqrt{5}}) =$ _____.

2. **(1 pt) pl/setSwift/setTrig06Inverses_srw7_6_1-8c.pg**
Evaluate the following expressions. Your answer must be in radians.
(a) $\arctan(1) =$ _____
(b) $\arctan(\frac{\sqrt{3}}{3}) =$ _____
(c) $\arctan(-\frac{\sqrt{3}}{3}) =$ _____

3. **(1 pt) pl/setDerivatives6InverseTrig/sc3_6_25.pg**
If $f(x) = 4\arcsin(x^4)$, find $f'(x)$.

_____

4. **(1 pt) pl/setSwift/setDerivatives6InverseTrig_sc3_6_27a.pg**
Let
$$f(x) = \arctan(9^x)$$
$f'(x) =$ _____

5. **(1 pt) pl/setDerivatives6InverseTrig/sc3_6_26.pg**
If $f(x) = 5x^4\arctan(6x^4)$, find $f'(x)$.

$f'(x) =$ _____ .

6. **(1 pt) pl/setDerivatives6InverseTrig/sc3_6_32.pg**
If $f(x) = 7\sin(8x)\arcsin(x)$, find $f'(x)$.

$f'(x) =$ _____ .

7. **(1 pt) pl/setDerivatives7Log/mec1.pg**
Let
$$f(x) = 2\ln(3x)$$
$f'(x) =$ _____
$f'(3) =$ _____

8. **(1 pt) pl/setDerivatives7Log/mec4.pg**
Let
$$f(x) = [\ln x]^6$$
$f'(x) =$ _____
$f'(e^4) =$ _____

9. **(1 pt) pl/setSwift/setDerivatives7Log_mec6.pg**
Let
$$f(x) = \ln|x^9|$$
$f'(x) =$ _____
$f'(-e^2) =$ _____

10. **(1 pt) pl/setDerivatives7Log/mec3.pg**
Let
$$f(x) = 4x^2\ln x$$
$f'(x) =$ _____
$f'(e^3) =$ _____

11. **(1 pt) pl/setSwift/setDerivatives7Log_mec8.pg**
Let
$$f(x) = \ln\sqrt{\left|\frac{8x-6}{3x+9}\right|}$$
$f'(x) =$ _____
Hint: Simplify f first. It can be written as $f(x) = (\ln|p(x)| - \ln|q(x)|)/2$, where p and q are linear functions.

12. **(1 pt) pl/setDerivatives7Log/ur_dr_7_2.pg**
If $f(x) = e^2 + \ln(6)$,
then $f'(x) =$ _____

13. **(1 pt) pl/setDervLogs/an4_3_42.pg**
Let $f(x) = 4^{x\tan(x)}$. Find $f'(x)$.
$f'(x) =$ _____

14. **(1 pt) pl/setDervLogs/an4_3_45.pg**
Let $f(x) = (\ln x)^{\sec x}$. Find $f'(x)$.
$f'(x) =$ _____

15. **(1 pt) pl/setDerivatives7Log/mec10b.pg**
Let
$$f(x) = \frac{x^6(x-3)^5}{(x^2+9)^8}$$
Use logarithmic differentiation to determine the derivative.
$f'(x) = \frac{x^6(x-3)^5}{(x^2+9)^8} \cdot$ (_____).

16. **(1 pt) pl/setDerivatives3WordProblems/s2_3_24.pg**
The population of a slowly growing bacterial colony after t hours is given by $p(t) = 3t^2 + 33t + 150$. The instantaneous growth rate after 2 hours is _____ bacteria per hour.

1. **(1 pt) pl/setSwift/popGrowthRate.pg**
A population of bacteria grows exponentially, doubling every 45 minutes. When there are 10^5 bacteria, the population is growing at a rate of ________ bacteria per minute.

2. **(1 pt) pl/setSwift/differential1.pg**
If $f(x) = 6x^2 - 8x - 36$, then the differential of f is

$df = (\_\_\_\_\_\_) \cdot dx$

3. **(1 pt) pl/setSwift/differential2.pg**
If $u = \sqrt{5x+11}$, then the differential of u is

$du = (\_\_\_\_\_\_) \cdot dx.$

4. **(1 pt) pl/setSwift/setDerivatives9Approximations_s2_9_36.pg**
The linear approximation to $f(x) = \sin(4x)$ at $x = 0$ is $L(x) = A + Bx$ where $A =$ ____ and where $B =$ ____

5. **(1 pt) pl/setSwift/setDerivatives9Approximations_s2_9_19a.pg**
Use linear approximation, i.e. the tangent line, to approximate $\sqrt{16.3}$ as follows:
Let $f(x) = \sqrt{x}$. The equation of the tangent line to $f(x)$ at $x = 16$ can be written in the form $y = y_0 + m(x-16)$ where $m =$ ___ and $y_0 =$ ___ .
Using this, we find our approximation: $\sqrt{16.3} \approx$ ____ .
NOTE: For this part use fractions to give the exact answer.
The relative error of this approximation is ______________ per cent.

6. **(1 pt) pl/setSwift/setDerivatives9Approximations_s2_9_Y.pg**
Use linear approximation, i.e. the tangent line, to approximate 102^3 as follows:
Let $f(x) = x^3$. The equation of the tangent line to $f(x)$ at $x = 10^2$ is best written in the form $y = f(a) + f'(a) \cdot (x-a)$ where $a =$ ___, $f(a) =$ ____ , and $f'(a) =$ ____ .

Using this, we find our approximation: $102^3 \approx$ ________ .

7. **(1 pt) pl/setDerivatives9Approximations/s2_9_Aa.pg**
Use linear approximation, i.e. the tangent line, to approximate $\frac{1}{0.102}$ as follows: Let $f(x) = \frac{1}{x}$ and find the equation of the tangent line to $y = f(x)$ at a "nice" point near 0.102.

The "nice" point in this case is $x =$ ___, and the linear approximation gives $\frac{1}{0.102} \approx$ ____ .

8. **(1 pt) pl/setDerivatives9Approximations/ur_dr_9_1.pg**
Find the linear approximation of $f(x) = \ln x$ at $x = 1$ and use it to estimate $\ln 1.02$.
$L(x) =$ ____
$\ln 1.02 \approx$ ____

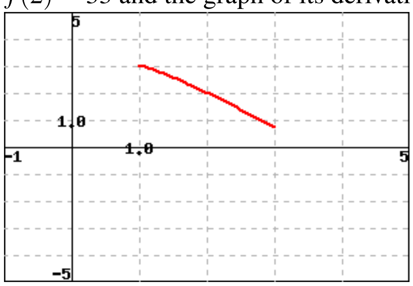
9. **(1 pt) pl/setDerivatives9Approximations/c2s9p8.pg**
Suppose that you can calculate the derivative of a function using the formula $f'(x) = 5f(x) + 3x$.
If $f(2) = 6$, use the linear approximation to estimate $f(2.008) \approx$ ________ .
Try using linear approximation. This is the basis of a method for solving differential equations called Euler's method .
(Show hint after 0 attempts.)

10. **(1 pt) pl/setSwift/setDerivatives9Approximations_c2s9p7.pg**
Use linear approximation to estimate the amount of paint needed to apply a coat of paint 0.05 cm thick to a hemispherical dome with a diameter of 45 meters.

The volume of paint needed is approximately ________ cubic centimenters.

Hint: The volume of a hemisphere of radius r is $V = f(r) = \frac{1}{2}\frac{4}{3}\pi r^3 = \frac{2}{3}\pi r^3$. The amount of paint needed is $f(r+\Delta r) - f(r)$.

11. **(1 pt) pl/setDerivatives9Approximations/nsc2s9p11.pg**
Suppose you have a function $f(x)$ and all you know is that $f(2) = 33$ and the graph of its derivative is:



Use linear approximation to get the estimate $f(2.2) \approx$ ____
Is your answer a little too big or a little too small? (Enter TB or TS): ____

12. **(1 pt) pl/setSwift/setDerivatives9Approximations_c2s9p10.pg**
Let $f(t)$ be the mass (in grams) at time t (in minutes) of a solid sitting in a beaker of water. Suppose that the solid dissolves in such a way that the rate of change (in grams/minute) of the mass of the solid at any time t can be determined from the mass using the formula:

$$f'(t) = -0.2f(t)(2 + f(t))$$

If there are 6 grams of solid at time $t = 2$ minutes, estimate the amount of solid 1 second later.

mass $\approx$ ____________ .

WeBWorK assignment number 17_Related_Rates is due : 04/09/2009 at 02:00am MST.

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1. **(1 pt) pl/setDerivatives8RelatedRates/s2_8_3.pg**
Let

$$xy = 1$$

and let

$$\frac{dy}{dt} = 2$$

Find $\frac{dx}{dt}$ when $x = 3$.
____

---

2. **(1 pt) pl/setDerivatives8RelatedRates/s2_8_2.pg**
Let A be the area of a circle with radius r. If $\dfrac{dr}{dt} = 5$, find $\dfrac{dA}{dt}$ when $r = 3$. __________

---

3. **(1 pt) pl/setDerivatives8RelatedRates/s2_8_5.pg**
A spherical snowball is melting in such a way that its diameter is decreasing at rate of 0.3 cm/min. At what rate is the volume of the snowball decreasing when the diameter is 12 cm. (Note the answer is a positive number).

____

---

4. **(1 pt) pl/setDerivatives8RelatedRates/SRM_c2s8p2.pg**
The altitude of a triangle is increasing at a rate of 3.000 centimeters/minute while the area of the triangle is increasing at a rate of 1.500 square centimeters/minute. At what rate is the base of the triangle changing when the altitude is 8.000 centimeters and the area is 92.000 square centimeters? ______________
Note: The "altitude" is the "height" of the triangle in the formula "Area=(1/2)*base*height". Draw yourself a general "representative" triangle and label the base one variable and the altitude (height) another variable. Note that to solve this problem you don't need to know how big nor what shape the triangle really is.

---

5. **(1 pt) pl/setDerivatives8RelatedRates/s2_8_12.pg**
At noon, ship A is 10 nautical miles due west of ship B. Ship A is sailing west at 23 knots and ship B is sailing north at 25 knots. How fast (in knots) is the distance between the ships changing at 7 PM? (Note: 1 knot is a speed of 1 nautical mile per hour.)

____

---

6. **(1 pt) pl/setDerivatives8RelatedRates/c2s8p5.pg**
A plane flying with a constant speed of 4 km/min passes over a ground radar station at an altitude of 15 km and climbs at an angle of 25 degrees. At what rate, in km/min is the distance from the plane to the radar station increasing 3 minutes later?

____

Hint: The law of cosines for a triangle is

$$c^2 = a^2 + b^2 - 2ab\cos(\theta)$$

where θ is the angle between the sides of length a and b.
(Show hint after 0 attempts.)

---

7. **(1 pt) pl/setDerivatives8RelatedRates/SRM_c2s8p3.pg**
Water is leaking out of an inverted conical tank at a rate of 10000.0 cubic centimeters per min at the same time that water is being pumped into the tank at a constant rate. The tank has height 6.0 meters and the diameter at the top is 5.0 meters. If the water level is rising at a rate of 28.0 centimeters per minute when the height of the water is 5.0 meters, find the rate at which water is being pumped into the tank in cubic centimeters per minute. ______________
Note: Let "R" be the unknown rate at which water is being pumped in. Then you know that if V is volume of water, $\frac{dV}{dt} = R - 10000.0$. Use geometry (similar triangles?) to find the relationship between the height of the water and the volume of the water at any given time. Recall that the volume of a cone with base radius r and height h is given by $\frac{1}{3}\pi r^2 h$.

---

1. **(1 pt) pl/setSwift/setDerivatives10MaxMin_c3s3p1.pg**
The function

$$f(x) = 4x^3 + 6x^2 - 360x - 5$$

is decreasing on the interval [___ , ___].
It is increasing on the interval ($-\infty$, ___]
and the interval [___, ∞).
The function has a local maximum at _____.

---

2. **(1 pt) pl/setDerivatives10MaxMin/s3_3_3.pg**
Consider the function $f(x) = -3x^2 + 2x - 1$. $f(x)$ is increasing on the interval $(-\infty, A]$ and decreasing on the interval $[A, \infty)$ where A is the critical number.
Find A _____
At $x = A$, does $f(x)$ have a local min, a local max, or neither? Type in your answer as LMIN, LMAX, or NEITHER. _____

---

3. **(1 pt) pl/setDerivatives10MaxMin/ur_dr_10_2.pg**
The function $f(x) = (2x - 4)e^{-5x}$ has one critical number. Find it.

_____

---

4. **(1 pt) pl/setSwift/setDerivatives10MaxMin_s3_1_39.pg**
Consider the function $f(x) = 4x^2 - 4x + 7, \quad 0 \le x \le 10$. The global maximum value of $f(x)$ (on the given interval) is _____ and the global minimum value of $f(x)$ (on the given interval) is _____

---

5. **(1 pt) pl/setDerivatives10MaxMin/s3_1_43.pg**
The function $f(x) = -2x^3 + 36x^2 - 120x + 11$ has one local minimum and one local maximum.
This function has a local minimum at x equals ___ with value __________
and a local maximum at x equals ___ with value __________

---

6. **(1 pt) pl/setDerivatives10MaxMin/s3_3_6.pg**
Consider the function $f(x) = -2x^3 + 42x^2 - 240x + 3$. For this function there are three important intervals: $(-\infty, A]$, $[A, B]$, and $[B, \infty)$ where A and B are the critical numbers.
Find A _____
and B _____
For each of the following intervals, tell whether $f(x)$ is increasing (type in INC) or decreasing (type in DEC).
$(-\infty, A]$: _____
$[A, B]$: _____
$[B, \infty)$: _____

---

7. **(1 pt) pl/setDerivatives10MaxMin/s3_3_10.pg**
Consider the function $f(x) = 12x^5 + 45x^4 - 200x^3 + 2$. For this function there are four important intervals: $(-\infty, A]$, $[A, B]$, $[B, C]$, and $[C, \infty)$ where A, B, and C are the critical numbers.
Find A _____
and B _____
and C _____
At each critical number A, B, and C does $f(x)$ have a local min, a local max, or neither? Type in your answer as LMIN, LMAX, or NEITHER.
At A _____
At B _____
At C _____

---

8. **(1 pt) pl/setSwift/setDerivatives10MaxMinAbsVal.pg**
Consider the function $f(x) = |x^2 + 5x - 6|$. For this function there are four important intervals: $(-\infty, A]$, $[A, B]$, $[B, C]$, and $[C, \infty)$ where A, B, and C are the critical numbers.
Find A _____
and B _____
and C _____
At each critical number A, B, and C does $f(x)$ have a local min, a local max, or neither? Type in your answer as LMIN, LMAX, or NEITHER.
At A _____
At B _____
At C _____

---

9. **(1 pt) pl/setDerivatives10MaxMin/ur_dr_10_1.pg**
The function $f(x) = 4x + 2x^{-1}$ has one local minimum and one local maximum.
This function has a local maximum at $x =$ __________ with value __________
and a local minimum at $x =$ __________ with value __________

---

10. **(1 pt) pl/setSwift/setDerivatives10MaxMin_c3s4p1.pg**
Answer the following questions for the function

$$f(x) = x\sqrt{x^2 + 36}$$

defined on the interval $[-5, 6]$.

A. $f(x)$ is concave down on the interval _____ to _____
B. $f(x)$ is concave up on the interval _____ to _____
C. The inflection point for this function is at _____
D. The global minimum for this function occurs at _____
E. The global maximum for this function occurs at _____

---

11. **(1 pt) pl/setSwift/setDerivatives10MaxMin_c3s4p3a.pg**
Answer the following questions for the function

$$f(x) = \frac{x^3}{x^2 - 36}$$

with the domain $[-20, 16]$. It can be shown that

$$f''(x) = \frac{72x(108 + x^2)}{x^2 - 36}.$$

Enter points, such as inflection points in ascending order, i.e. smallest x values first. Enter intervals in ascending order also.
The function $f(x)$ has vertical asympototes $x =$ _____ and $x =$ _____.
$f(x)$ is concave up on the interval (_____ , _____]
and on the interval (_____, _____].

The inflection point for this function is $(a, f(a))$, where $a =$ _____.

NOTE: A function must be continuous at an inflection point.

---

12. **(1 pt) pl/setDerivatives10MaxMin/osu_dr_10_1.pg**

Consider the function

$$f(x) = \frac{e^x}{7+e^x}$$

Then $f'(x) =$ __________

The following questions ask for endpoints of intervals of increase or decrease for the function $f(x)$.
Write INF for ∞, MINF for $-\infty$, and NA (ie. not applicable) if there are no intervals of that type.

The interval of increase for $f(x)$ is from __________

to __________

The interval of decrease for $f(x)$ is from __________

to __________

$f(x)$ has a local minimum at __________. (Put NA if none.)

$f(x)$ has a local maximum at __________. (Put NA if none.)

Then $f''(x) =$ ____________________

The following questions ask for endpoints of intervals of upward and downward concavity for the function $f(x)$.
Write INF for ∞, MINF for $-\infty$, and put NA if there are no intervals of that type.

The interval of upward concavity for $f(x)$ is from __________

to __________

The interval of downward concavity for $f(x)$ is from __________

to __________

$f(x)$ has a point of inflection at __________. (Put NA if none.)

---

13. **(1 pt) pl/setDerivatives10MaxMin/s3_4_6a.pg**

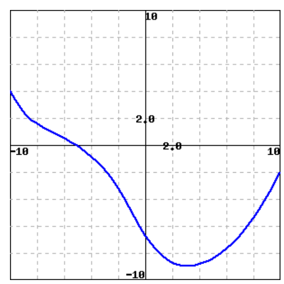
Consider the function $f(x) = 5x + 5x^{-1}$. For this function there are four important intervals: $(-\infty, A]$, $[A, B)$,$(B, C]$, and $[C, \infty)$ where A, and C are the critical numbers and the function is not defined at B.
Find A _____
and B _____
and C _____
For each of the following intervals, tell whether $f(x)$ is increasing (type in INC) or decreasing (type in DEC).
$(-\infty, A]$: _____
$[A, B)$: _____
$(B, C]$: _____
$[C, \infty)$ _____
Note that this function has no inflection points, but we can still consider its concavity. For each of the following intervals, tell whether $f(x)$ is concave up (type in CU) or concave down (type in CD).
$(-\infty, B)$: _____
(B, ∞): _____

---

14. **(1 pt) nauLibrary/setCalcI/func_anal_a.pg**

Function Analysis

The graph of the function f is given below. Assume that f is as smooth as the graph allows.



Fill in the function analysis table.

x		$x < -7$	$x = -7$	$-7 < x < -1$	$x = -1$	$-1 < x < 3$	$x = 3$
f		?	?	?	?	?	?
		?		?		?	
f'		?	?	?	?	?	?
		?		?		?	
f''		?	?	?	?	?	?

WeBWorK assignment number 19_Optimization is due : 04/17/2009 at 02:00am MST.

1. **(1 pt) pl/setDerivatives10_5Optim/c3s8p1.pg**
Find the point on the line $5x+2y+1=0$ which is closest to the point $(2,2)$.

The closest point is (______, ______).

2. **(1 pt) pl/setDerivatives10_5Optim/c3s8p2.pg**
A rectangle is inscribed with its base on the x-axis and its upper corners on the parabola $y=1-x^2$. What are the dimensions of such a rectangle with the greatest possible area?
Width = ______
Height = ______

3. **(1 pt) pl/setDerivatives10_5Optim/nsc4_6_16b.pg**
A fence 3 feet tall runs parallel to a tall building at a distance of 2 feet from the building. We want to find the the length of the shortest ladder that will reach from the ground over the fence to the wall of the building.

Here are some hints for finding a solution:
Let x be the angle that the ladder makes with the ground. Draw a picture of the ladder leaning against the wall of the building and just touching the top of the fence. The lenght of the ladder is the sum of two parts: the distance along the ladder from the ground to the top of the fence plus the distance along the ladder from the top of the fence to the wall.

Using these hints write a function $L(x)$ which gives the total length of a ladder which touches the ground at an angle x, touches the top of the fence and just reaches the wall.
$L(x)$ = ______ feet.

The length of the shortest ladder which will clear the fence is ______ feet.

4. **(1 pt) pl/setDerivatives10_5Optim/nsc4_6_3.pg**
If 1500 square centimeters of material is available to make a box with a square base and an open top, find the largest possible volume of the box.
Volume = ______ cubic centimeters.

5. **(1 pt) pl/setDerivatives10_5Optim/nsc4_7_16a.pg**
The manager of a large apartment complex knows from experience that 120 units will be occupied if the rent is 342 dollars per month. A market survey suggests that, on the average, one additional unit will remain vacant for each 9 dollar increase in rent. Similarly, one additional unit will be occupied for each 9 dollar decrease in rent. If the rent is set at x dollars, then ______ units will be rented out, and the total revenue for the apartment complex will be ______ dollars.

The manager should set the rent at ______ dollars to maximize revenue.

6. **(1 pt) pl/setDerivatives10_5Optim/s3_8_26a.pg**
A Norman window has the shape of a semicircle atop a rectangle so that the diameter of the semicircle is equal to the width of the rectangle. Due to building codes, the perimeter of the window must be 44 feet. If r is the radius of the semicircle, then the area of the window is ______ square feet. The largest posible Norman window with this perimeter has an area of ______ square feet.

7. **(1 pt) pl/setDerivatives10_5Optim/s3_8_6.pg**
A rancher wants to fence in an area of 2000000 square feet in a rectangular field and then divide it in half with a fence down the middle parallel to one side. The shortest total length of fence that the rancher can use is ______ feet.

1. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_20a.pg**
For each of the following forms determine whether the following limit type is indeterminate, always has a fixed finite value, or never has a fixed finite value. In the first case answer IND, in the second case enter the numerical value, and in the third case answer DNE. For example
The answer to $\frac{0}{0}$ is IND. This means
if $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 0$, then $\lim_{x\to a} \frac{f(x)}{g(x)}$ is an indeterminate form of type $\frac{0}{0}$.
The answer to $\frac{0}{1}$ is 0. This means
if $\lim_{x\to a} f(x) = 0$ and $\lim_{x\to a} g(x) = 1$, then $\lim_{x\to a} \frac{f(x)}{g(x)} = 0$.
The answer to $\frac{1}{0}$ is DNE. This means
if $\lim_{x\to a} f(x) = 1$ and $\lim_{x\to a} g(x) = 0$, then $\lim_{x\to a} \frac{f(x)}{g(x)}$ does not exist.
Note that l'Hôpital's rule (in some form) may ONLY be applied to indeterminate forms.

___1. ∞^0
___2. 0^∞
___3. π^∞
___4. $\frac{\infty}{0}$
___5. ∞^1
___6. ∞^{-e}
___7. $\infty \cdot \infty$
___8. $1 \cdot \infty$
___9. 1^∞
___10. $\frac{0}{\infty}$
___11. 0^0
___12. $\infty - \infty$
___13. $\frac{1}{-\infty}$
___14. $0^{-\infty}$
___15. $\pi^{-\infty}$
___16. 1^0
___17. ∞^∞
___18. $\infty^{-\infty}$
___19. $1^{-\infty}$
___20. $0 \cdot \infty$

2. **(1 pt) pl/setDerivatives21LHospital/sc4_5_3.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to 0} \frac{e^x - 1}{\sin(8x)} = \_\_\_\_\_ .$$

3. **(1 pt) pl/setDerivatives21LHospital/sc4_5_4a.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to 0} \frac{\sin(14x)}{\tan(12x)} = \_\_\_\_\_ .$$

4. **(1 pt) pl/setDerivatives21LHospital/sc4_5_8.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to 0} \frac{7^x - 3^x}{x} = \_\_\_\_\_ .$$

5. **(1 pt) pl/setDerivatives21LHospital/sc4_5_23.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to \infty} 13xe^{1/x} - 13x = \_\_\_\_\_ .$$

6. **(1 pt) pl/setDerivatives21LHospital/ur_dr_21_3.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to 0} \frac{e^x + 2x - 1}{7x} = \_\_\_\_\_ .$$

7. **(1 pt) pl/setDerivatives21LHospital/ur_dr_21_1.pg**
Evaluate the limit using l'Hôpital's rule.

$$\lim_{x\to \infty} \frac{11x^2}{e^{10x}} = \_\_\_\_\_ .$$

8. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_1.pg**
Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$$\lim_{x\to 1} \frac{6^x - 6}{x^2 - 1} = \_\_\_\_\_ .$$

$$\lim_{x\to \infty} \frac{\tan^{-1}(x)}{(1/x) - 6} = \_\_\_\_\_ .$$

9. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_10.pg**
Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$$\lim_{x\to \infty} \frac{\ln(x^6 - 4)}{\ln(x)\cos(1/x)} = \_\_\_\_\_\_\_\_\_\_ .$$

$$\lim_{x\to \infty} \frac{e^{4x}}{e^{5x} - e^{-5x}} = \_\_\_\_\_\_\_\_\_\_ .$$

10. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_2.pg**
Compute the following limits using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$$\lim_{x\to 0} \frac{1 - \cos(4x)}{1 - \cos(3x)} = \_\_\_\_\_\_\_\_\_\_ .$$

$$\lim_{x\to 1} \frac{4^x - 3^x - 1}{x^2 - 1} = \_\_\_\_\_\_\_\_\_\_ .$$

11. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_3.pg**
Compute the following limit using l'Hôpital's rule if appropriate. Use INF to denote ∞ and MINF to denote $-\infty$.

$$\lim_{x\to \infty} \left(1 - \frac{2}{x}\right)^x = \_\_\_\_\_\_\_\_\_\_ .$$

12. **(1 pt) pl/setDerivatives21LHospital/osu_dr_21_6.pg**
Find the following limits, using l'Hôpital's rule if appropriate.

$$\lim_{x\to\infty} \frac{\arctan(x^3)}{x^6} = \underline{\hspace{2cm}} .$$

$$\lim_{x\to 0^+} \sqrt[6]{x}\ln(x) = \underline{\hspace{2cm}} .$$

13. **(1 pt) pl/setDerivatives21LHospital/sc4_5_00-asympt.b.pg**
Use l'Hôpital's rule to find the horizontal asymptote of $y = \sqrt{x^2+4x-2} - x$. Its equation is $y =$ ____ .

14. **(1 pt) nauLibrary/setCalcI/lHospitalThrice.pg**
Evaluate the limit using repeated applications of l'Hôpital's rule.

$$\lim_{x\to 0} \frac{2e^{3x} - 9x^2 - 6x - 2}{2x^3} = \underline{\hspace{1cm}} .$$

15. **(1 pt) pl/setDerivatives11Newton/s2_10_3.pg**
Use Newton's method to approximate a root of the equation $x^3 + x + 4 = 0$ as follows.
Let $x_1 = -1$ be the initial approximation.
The second approximation x_2 is ________
and the third approximation x_3 is ________

16. **(1 pt) pl/setDerivatives11Newton/s2_10_11a.pg**
Use Newton's method to approximate a root of the equation $9\sin(x) = x$ as follows.
Use the storage feature on your calculator, as described in class.
Let $x_1 = 1$ be the initial approximation.
The second approximation x_2 is ____________
The third approximation x_3 is ____________
The fourth approximation x_4 is ____________

17. **(1 pt) nauLibrary/setCalcI/expLinNewt.pg**
Use Newton's method to approximate a solution of the equation $e^{-3x} = 2x - 6$, starting with the initial guess indicated.
$x_1 = -3$.
$x_2 =$ ____ .
$x_3 =$ ____ .
The solution to the equation found by Newton's method is $x =$ ____ .

WeBWorK assignment number 21_Indef_Integral is due : 04/24/2009 at 02:00am MST.

1. **(1 pt) pl/setDerivatives20Antideriv/s3_10_2.pg**
Consider the function $f(x) = 9x^3 - 10x^2 + 3x - 8$.
An antiderivative of $f(x)$ is $F(x) = Ax^4 + Bx^3 + Cx^2 + Dx$
where A is ____ and B is ____ and C is ____ and D is ____

2. **(1 pt) pl/setDerivatives20Antideriv/ur_dr_20_2a.pg**
Let $f(x) = \dfrac{20}{\sqrt{1-x^2}}$. The general antiderivative of $f(x)$ is
$F(x) =$ ________ $+C$, where C is an arbitrary constant.

3. **(1 pt) pl/setDerivatives20Antideriv/s3_10_3.pg**
Consider the function $f(x) = 3x^{10} + 7x^6 - 4x^4 - 8$.
An antiderivative of $f(x)$ is $F(x) = Ax^n + Bx^m + Cx^p + Dx^q$ where
A is ____ and n is ____
and B is ____ and m is ____
and C is ____ and p is ____
and D is ____ and q is ____

4. **(1 pt) pl/setDerivatives20Antideriv/ur_dr_20_1.pg**
Let $f(x) = \dfrac{4}{x} - 2e^x$.
Enter an antiderivative of $f(x)$
$F(x) =$ ____________ .

5. **(1 pt) pl/setDerivatives20Antideriv/s3_10_8func.pg**
Consider the function $f(x) = \dfrac{3}{x^2} - \dfrac{5}{x^7}$.
Let $F(x)$ be the antiderivative of $f(x)$ with $F(1) = 0$.
Then $F(x) =$ ______________

6. **(1 pt) nauLibrary/setCalcI/antiExp.pg**
If $f'(x) = -6xe^{x^2}$ and $f(0) = 8$, then
$f(x) =$ ____________ .

7. **(1 pt) pl/setDerivatives20Antideriv/c3s10p5a.pg**
Given $f''(x) = -4\sin(2x)$ and $f'(0) = 2$ and $f(0) = -4$, find $f(x)$.
$f(x) =$ ____________ .

8. **(1 pt) pl/setIntegrals2Indefinite/ur_in_2_1cen.pg**
Evaluate the indefinite integral:

$$\int \left(\frac{6}{x^3} + \frac{8}{11x}\right) dx = \text{\_\_\_\_\_\_\_\_\_\_\_\_} + C.$$

9. **(1 pt) pl/setIntegrals2Indefinite/ur_in_2_2.pg**
Evaluate the indefinite integral

$$\int 7e^x dx$$

____

10. **(1 pt) nauLibrary/setCalcI/simple_int.pg**
Evaluate the indefinite integral.

$$\int \left(-6\sin(t) - 9\cos(t) - 6\sec^2(t) - 5e^t + \frac{2}{\sqrt{1-t^2}} + \frac{3}{1+t^2}\right) dt = \text{\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_} + C.$$

11. **(1 pt) pl/setIntegrals2Indefinite/ur_in_2_2a.pg**
Evaluate the indefinite integral:

$$\int 4e^{4x} dx = \text{\_\_\_\_} + C.$$

WeBWorK assignment number 22_Substitution is due : 04/27/2009 at 02:00am MST.

1. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_2.pg**

Note: You can get full credit for this problem by just answering the last question correctly. The initial questions are meant as hints towards the final answer and also allow you the opportunity to get partial credit.

Consider the indefinite integral $\int x^5 \left(6+5x^6\right)^{10}\, dx$

Then the most appropriate substitution to simplify this integral is

$u =$ ______

Then $dx = f(x)\, du$ where

$f(x) =$ ______

After making the substitution we obtain the integral $\int g(u)\, du$ where

$g(u) =$ ______

This last integral is: = ______ $+C$

(Leave out constant of integration from your answer.)

After substituting back for u we obtain the following final form of the answer:

= ______ $+C$

(Leave out constant of integration from your answer.)

2. **(1 pt) pl/setIntegrals14Substitution/sc5_5_1.pg**

Evaluate the integral.

$$\int x^4 (x^5-1)^5 dx = \text{\_\_\_\_\_\_} + C.$$

Hints: Make the substitution $u = x^5 - 1$. Your answer should be in terms of x, not u.

3. **(1 pt) pl/setIntSubstitution/an6_3_01and02.pg**

(a) Evaluate the indefinite integral.

$\int e^{3x}\, dx =$ ______ $+C$.

(b) Evaluate the indefinite integral.

$\int \sin(-10x)\, dx =$ ______ $+C$.

4. **(1 pt) pl/setIntegrals14Substitution/sc5_5_26.pg**

Evaluate the indefinite integral:

$\int 4e^{4x} \sin(e^{4x})\, dx =$ ______ + C.

5. **(1 pt) pl/setIntegrals14Substitution/mec_int2.pg**

Evaluate the indefinite integral.

$\int \frac{(\arctan x)^9}{1+x^2} dx =$ ______ + C.

6. **(1 pt) pl/setIntegrals14Substitution/sc5_5_29.pg**

Evaluate the indefinite integral.

$\int \frac{x+3}{x^2+6x} dx =$ ______ + C.

7. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_8a.pg**

Find the following indefinite integrals.

$\int \frac{x}{\sqrt{x+4}} dx =$ ______ $+C$

8. **(1 pt) pl/setIntegrals14Substitution/sc5_5_20.pg**

Evaluate the indefinite integral.

$$\int \frac{\cos x}{5\sin x + 10} dx = \text{\_\_\_\_\_\_} + C.$$

9. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_9.pg**

$\int \sqrt[4]{e^x}\, dx =$ ______ $+ C$

10. **(1 pt) pl/setIntegrals14Substitution/mec_int3.pg**

Evaluate the indefinite integral.

$\int \frac{e^{8x}}{e^{16x}+64} dx =$ ______ + C.

11. **(1 pt) pl/setIntegrals14Substitution/sc5_5_7.pg**

Evaluate the indefinite integral.

$$\int \frac{(\ln(x))^2}{x} dx$$

______ $+C$

12. **(1 pt) pl/setIntSubstitution/an6_3_10.pg**

Evaluate the indefinite integral.

$\int \frac{e^{\sqrt{2x+8}}}{\sqrt{2x+8}} dx =$ ______ $+C$.

WeBWorK assignment number 23_Definite_Integral is due : 04/30/2009 at 02:00am MST.

1. (1 pt) nauLibrary/setCalcI/areaIntegralPos.pg

You are given the four points in the plane $A=(2,8)$, $B=(5,8)$, $C=(10,3)$, and $D=(15,0)$. The graph of the function $f(x)$ consists of the three line segments AB, BC and CD. Find the integral $\int_2^{15} f(x)\,dx$ by interpreting the integral in terms of sums of areas of elementary figures.

$\int_2^{15} f(x)\,dx =$ ________ .

2. (1 pt) pl/setIntegrals0Theory/sc5_2_24.pg

Evaluate the integral below by interpreting it in terms of areas. In other words, draw a picture of the region the integral represents, and find the area using high school geometry.

$\int_{-4}^{4} \sqrt{16-x^2}dx =$ ________ .

3. (1 pt) pl/setIntegrals0Theory/sc5_2_28.pg

Evaluate the integral by interpreting it in terms of areas. In other words, draw a picture of the region the integral represents, and find the area using high school geometry.

$\int_0^8 |2x-10|\,dx =$ ________ .

4. (1 pt) pl/setIntegrals0Theory/osu_in_0_14a.pg

You are given the four points in the plane $A=(8,-4)$, $B=(10,-6)$, $C=(14,0)$, and $D=(19,7)$. The graph of the function $f(x)$ consists of the three line segments AB, BC and CD. Find the integral $\int_8^{19} f(x)\,dx$ by interpreting the integral in terms of sums and/or differences of areas of elementary figures.

$\int_8^{19} f(x)\,dx =$ ________ .

5. (1 pt) pl/setIntegrals0Theory/ur_in_0_2.pg

Evaluate the definite integral by interpreting it in terms of areas.

$\int_2^8 (4x-20)dx$ ____________.

6. (1 pt) pl/setIntegrals0Theory/sc5_2_3.pg

Consider the integral

$$\int_2^8 (4x^2+2x+4)\,dx$$

(a) Find the Riemann sum for this integral using right endpoints and $n=3$.

$R_3 =$ ____________________ .

(b) Find the Riemann sum for this same integral, using left endpoints and $n=3$.

$L_3 =$ ____________________ .

7. (1 pt) pl/setIntegrals0Theory/sc5_2_2a.pg

Use the Midpoint Rule to approximate

$$\int_{-1.5}^{5.5} x^3\,dx$$

with $n=7$.

$M_7 =$ ________________ .

8. (1 pt) pl/setIntegrals0Theory/sc5_2_5.pg

Use the Midpoint Rule to approximate the integral

$$\int_8^{20} (2x-9x^2)dx$$

with $n=3$.

$M_3 =$ ________________.

9. (1 pt) pl/setIntegrals0Theory/sc5_2_30.pg

$$\int_8^{11} f(x)\,dx - \int_8^{10} f(x)\,dx = \int_a^b f(x)\,dx$$

where $a =$ ____ and $b =$ ____

10. (1 pt) pl/setIntegrals0Theory/ur_in_0_13.pg

Let $\int_{-1}^{3.5} f(x)dx = 4$, $\int_{-1}^{0.5} f(x)dx = 6$, and $\int_2^{3.5} f(x)dx = 7$. Then

$\int_{0.5}^{2} f(x)dx =$ ____ and $\int_2^{0.5} (4f(x)-6)dx =$ ____ .

11. (1 pt) pl/setIntegrals0Theory/ur_in_0_3.pg

Given that $3 \le f(x) \le 6$ for $-1 \le x \le 8$, use a comparison property of the integral to estimate the value of $\int_{-1}^{8} f(x)dx$

____ $\le \int_{-1}^{8} f(x)dx \le$ ____

12. (1 pt) pl/setIntegrals0Theory/ur_in_0_12.pg

In this problem you will calculate $\int_0^4 \left(\frac{x^2}{4}-8\right)dx$ by using the definition

$$\int_a^b f(x)\,dx = \lim_{n\to\infty}\left[\sum_{i=1}^{n} f(x_i)\Delta x\right]$$

The summation inside the brackets is R_n which is the Riemann sum where the sample points are chosen to be the right-hand endpoints of each sub-interval.

Calculate R_n for $f(x) = \frac{x^2}{4} - 8$ on the interval $[0,4]$ and write your answer as a function of n without any summation signs. You will need the summation formulas in your textbook

$x_i = \frac{4i}{n}$ and $\Delta x = \frac{4}{n}$.

(Show hint after 1 attempts.)

$R_n =$ ____________________ .

$\int_0^4 \left(\frac{x^2}{4} - 8 \right) dx = \lim_{n \to \infty} R_n =$ ________ .

1. **(1 pt) pl/setIntegrals3Definite/s4_4_17.pg**
Evaluate the definite integral

$$\int_4^8 (8x+7)dx = \_\_\_\_\_\_\_\_ .$$

2. **(1 pt) pl/setIntegrals3Definite/c4s4p6t.pg**
Find the value of the definite integral.

$$\int_3^6 \frac{1}{t^2} dt = \_\_\_\_\_\_ .$$

3. **(1 pt) pl/setIntegrals3Definite/osu_in_3_2.pg**
Evaluate the definite integral.

$$\int_2^8 \frac{7}{\sqrt{x}} dx = \_\_\_\_\_\_\_\_ .$$

4. **(1 pt) pl/setCalculusFundamentalTheorem/6-5-10.pg**
Evaluate the definite integral:

$$\int_4^{20} dx = \_\_ .$$

5. **(1 pt) pl/setCalculusFundamentalTheorem/6-5-20.pg**
Evaluate the definite integral.

$$\int_1^6 \frac{5}{x} dx = \_\_\_\_ .$$

6. **(1 pt) pl/setCalculusFundamentalTheorem/6-5-20_b.pg**
Evaluate the definite integral.

$$\int_{-3}^{-10} \frac{2}{x} dx = \_\_\_\_$$

7. **(1 pt) nauLibrary/setCalcI/int_upper_limit_x_lin.pg**
Evaluate the definite integral. Your answer will be a function of x.

$$\int_1^x (4t-8)dt = \_\_\_\_\_\_ .$$

9. **(1 pt) pl/setIntegrals3Definite/s4_4_41.pg**
Evaluate the definite integral. Evaluate any trig. functions in your answer.

$$\int_0^{\pi} 4\sin(x)dx = \_\_\_ .$$

10. **(1 pt) pl/setIntegrals3Definite/osu_in_3_3.pg**
Evaluate the integral.

$$\int_1^3 \frac{4x^2+2}{x^2} dx = \_\_\_\_\_\_ .$$

Note that there is no quotient rule for antiderivatives. Simplify the integrand before integrating.

11. **(1 pt) pl/setIntegrals3Definite/s4_4_21u.pg**
Evaluate the definite integral.

$$\int_{-10}^{10} (100-u^2)du = \_\_\_ .$$

12. **(1 pt) pl/setIntegrals3Definite/sc5_3_26a.pg**
Evaluate the integral.

$$\int_{-0.5}^{-0.6} \frac{dx}{\sqrt{1-x^2}} = \_\_\_\_\_\_ .$$

13. **(1 pt) pl/setIntegrals4FTC/osu_in_4_14.pg**
Evaluate the definite integral using the Fundamental Theorem of Calculus.

$$\int_1^2 \left(\frac{d}{dt} \sqrt{3+4t^4} \right) dt = \_\_\_\_\_\_\_\_\_\_$$

14. **(1 pt) pl/setIntegrals4FTC/sc5_4_13.pg**
Use part I of the Fundamental Theorem of Calculus to find the derivative of

$$f(x) = \int_2^x \frac{1}{1+t^2} dt$$

$f'(x) = \_\_\_\_\_\_$

15. **(1 pt) pl/setIntegrals4FTC/osu_in_4_17a.pg**
The following limit is an indeterminate form of type 0/0. Evaluate the limit using L'Hospital's rule.

$$\lim_{x\to 0} \frac{x}{\int_0^x \sqrt[3]{125-6t^3}\, dt} = \_\_\_\_\_\_$$

16. **(1 pt) pl/setIntegrals4FTC/sc5_4_18b.pg**
If

$$h(x) = \int_{-1}^{\sin(x)} (\cos(t^5)+t)\, dt$$

then $h'(x) = \_\_\_\_\_\_\_\_\_\_$.

Hint: Define

$$f(x) = \int_{-1}^{x} (\cos(t^5)+t)\, dt$$

Then $h(x) = f(\sin(x))$. Use the chain rule to compute $h'(x)$.

17. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_5a.pg**
Consider the definite integral $\int_{\pi/6}^{\pi/2} \frac{\cos(x)}{\sin^7(x)}\, dx$

Then the most appropriate substitution to simplify this integral is
$u =$ __________

Then $du = f(x)\, dx$ where
$f(x) =$ __________

After making the substitution and simplifying we find that $\int_{\pi/6}^{\pi/2} \frac{\cos(x)}{\sin^7(x)}\, dx = \int_a^b g(u)\, du$ where
$g(u) =$ __________
$a =$ __________
$b =$ __________

This definite integral has value = __________

18. **(1 pt) pl/setIntegrals14Substitution/sc5_5_44.pg**
Evaluate the definite integral.

$$\int_0^{\pi/4} \sin(4t)dt = \_\_\_ .$$

19. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_6a.pg**
Calculate the following definite integral.

$$\int_0^1 x^2\sqrt{9x+6}\,dx = \_\_\_\_\_\_\_\_\_\_ .$$

20. **(1 pt) pl/setIntegrals14Substitution/sc5_5_51.pg**
Evaluate the definite integral.

$$\int_1^{e^7} \frac{dx}{x\sqrt{\ln x}} = \_\_\_\_\_\_\_\_\_\_ .$$