WeBWorK assignment number 00_WeBWorK is due : 01/13/2010 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 $3(-4)(8-4-2(1))$: ____

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 (-4) * (8): ________

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 $-4*8$ or -32 or even -4 8. 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 1/2^.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 ^ 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.

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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.

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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.

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1. **(1 pt) pl/setChainRulePowerFunctions/3-6-37.pg**

Suppose that

$$y = \frac{8}{5x-2}.$$

Find $\frac{dy}{dx}$.

$\frac{dy}{dx}$ = ______

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2. **(1 pt) pl/setChainRuleExpLogFunctions/5-3-33.pg**

Evaluate $\frac{d}{dx}e^{3x^2+7x}$.

$\frac{d}{dx}e^{3x^2+7x}$ = ______

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3. **(1 pt) pl/setChainRuleExpLogFunctions/5-3-21.pg**

Evaluate $\frac{d}{dt}\ln(4+9t)$.

$\frac{d}{dt}\ln(4+9t)$ = ______

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4. **(1 pt) pl/setDerivativeBasicFunctions/3-4-50.pg**

Suppose that $f(x) = 8x^2 + 6x$. Find:

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

(B) The slope of the graph of $f(x)$ at $x = 2$ and $x = 3$.
Slope at x = 2: ______
Slope at x = 3: ______

(C) An equation for the tangent lines at $x = 2$ and $x = 3$.
Tangent line at x = 2: $y =$ ______
Tangent line at x = 3: $y =$ ______

(D) List all values of x where the tangent line is horizontal.
Value(s) of x = ______

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5. **(1 pt) pl/setDerivativeBasicFunctions/s2_2_11b.pg**

Let $f(x) = -8x^5\sqrt{x} + \frac{6}{x^2\sqrt{x}}$.

$f'(x) =$ ______

[NOTE: Your answer should be a function in terms of the variable 'x' and not a number!]

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6. **(1 pt) pl/setDerivatives4Trig/s2_4_24.pg**

If

$$f(x) = \frac{2\sin x}{2+\cos x}$$

find $f'(x)$.
$f'(x) =$ ______

Find $f'(1)$.
$f'(1) =$ ______

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7. **(1 pt) pl/setDerivatives4Trig/s2_4_27.pg**

If $f(x) = 4x(\sin x + \cos x)$, then

$f'(x) =$ ______ and

$f'(2) =$ ______ .

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8. **(1 pt) pl/setDerivatives5ChainRule/s2_5_2.pg**

Let

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

$f'(x) =$ ______
$f'(1) =$ ______

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9. **(1 pt) pl/setDerivatives5ChainRule/s2_5_4.pg**

If $f(x) = \sin(x^3)$, find $f'(x)$.

______

Find $f'(4)$.

______

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10. **(1 pt) pl/setDerivatives5ChainRule/s2_5_5.pg**

If $f(x) = \sin^2 x$, find $f'(x)$.

______

Find $f'(4)$.

______

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11. **(1 pt) pl/setDerivatives6InverseTrig/sc3_6_25.pg**

If $f(x) = 7\arcsin(x^3)$, find $f'(x)$.

______

12. **(1 pt) pl/setDerivatives6InverseTrig/sc3_6_26.pg**

If $f(x) = 2x^4 \arctan(9x^4)$, find $f'(x)$.

$f'(x) =$ ______________ .

13. **(1 pt) pl/setDerivatives7Log/sc3_7_4.pg**

If $f(x) = 3\cos(3\ln(x))$, find $f'(x)$.

____

Find $f'(4)$.

____

14. **(1 pt) pl/setDerivatives3WordProblems/s2_7_41a.pg**

A mass attached to a vertical spring has position function given by $s(t) = 3\sin(2t + 2.6) + 5$ 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/setDervLogs/an4_3_40.pg**

Let $f(x) = 4^{-x}$. Find $f'(x)$.

$f'(x) =$ ______________

16. **(1 pt) pl/setSwift/setDerivatives7Log_mec8.pg**

Let

$$f(x) = \ln\sqrt{\left|\frac{2x+4}{3x-6}\right|}$$

$f'(x) =$ ______________

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.

WeBWorK assignment number 02_Int_Review is due : 01/15/2010 at 02:00am MST.

1. **(1 pt) pl/setIntegrals3Definite/c4s4p6.pg**
Find the value of the definite integral.

$$\int_2^7 \frac{1}{x^2}\,dx = \_\_\_\_\_\_\_\_ .$$

2. **(1 pt) pl/setIntegrals3Definite/s4_4_27.pg**
Evaluate the definite integral

$$\int_2^5 \frac{8x^2+8}{\sqrt{x}}\,dx$$

____

3. **(1 pt) pl/setIntegrals3Definite/sc5_3_25.pg**
Evaluate the integral

$$\int_1^{\sqrt{5}} \frac{5}{1+x^2}\,dx$$

____

4. **(1 pt) pl/setIntegrals3Definite/sc5_3_26.pg**
Evaluate the integral.

$$\int_0^{0.1} \frac{dx}{\sqrt{1-x^2}} = \_\_\_\_\_\_\_\_ .$$

5. **(1 pt) pl/setIntegrals14Substitution/sc5_5_4.pg**
Evaluate the integral by making the given substitution.

$$\int \frac{dx}{(6x+9)^4}$$

$u = 6x+9$

____

6. **(1 pt) pl/setIntegrals14Substitution/sc5_5_7.pg**
Evaluate the indefinite integral.

$$\int \frac{(\ln(x))^8}{x}\,dx$$

__________ $+C$

7. **(1 pt) pl/setIntegrals14Substitution/sc5_5_29a.pg**
Evaluate the indefinite integral.

$$\int \frac{x+4}{x^2+8x+17}\,dx$$

____

8. **(1 pt) pl/setIntegrals14Substitution/sc5_5_44.pg**
Evaluate the definite integral.

$$\int_0^{\pi/3} \sin(3t)\,dt = \_\_\_ .$$

9. **(1 pt) pl/setIntegrals14Substitution/sc5_5_26.pg**
Evaluate the indefinite integral:

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

10. **(1 pt) pl/setIntegrals14Substitution/sc5_5_38.pg**
Evaluate the definite integral.

$$\int_0^{\pi/1} e^{\sin(x)}\cos(x)\,dx$$

____

11. **(1 pt) pl/setIntegrals14Substitution/sc5_5_20.pg**
Evaluate the indefinite integral.

$$\int \frac{\cos x}{2\sin x+4}\,dx = \_\_\_\_\_\_\_\_\_\_ +C.$$

12. **(1 pt) pl/setIntegrals14Substitution/osu_in_14_8a.pg**
Find the following indefinite integrals.

$$\int \frac{x}{\sqrt{x+6}}\,dx = \_\_\_\_\_\_\_\_\_\_\_\_\_\_ +C$$

13. **(1 pt) pl/setIntegrals0Theory/ur_in_0_11.pg**
Consider the integral

$$\int_3^7 \left(\frac{2}{x}+4\right)\,dx$$

(a) Find the Riemann sum for this integral using right endpoints and $n = 4$.

____

(b) Find the Riemann sum for this same integral, using left endpoints and $n = 4$

____

14. **(1 pt) pl/setIntegrals4FTC/sc5_4_14.pg**
Use part I of the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_x^5 \sin(t^4)\,dt$$

$F'(x) =$ __________

[NOTE: Enter a function as your answer.]

WeBWorK assignment number 03_Int_by_parts is due : 01/20/2010 at 02:00am MST.

1. **(1 pt) pl/setIntegrals15ByParts/sc5_6_2.pg**
Use integration by parts to evaluate the integral.

$$\int 5x\sin(x)dx$$

____

2. **(1 pt) pl/setIntegrals15ByParts/sc5_6_15.pg**
Evaluate the definite integral.

$$\int_0^7 te^{-t}dt$$

____

3. **(1 pt) pl/setIntegrals15ByParts/sc5_6_1.pg**
Use integration by parts to evaluate the integral.

$$\int xe^{4x}dx$$

______________________________ $+C$

4. **(1 pt) pl/setIntegrals15ByParts/sc5_6_11B.pg**
Evaluate the definite integral.

$$\int_2^6 t^3\ln(4t)dt$$

____

5. **(1 pt) pl/setIntegrals15ByParts/sc5_6_41.pg**
A particle that moves along a straight line has velocity

$$v(t) = t^2e^{-2t}$$

meters per second after t seconds. How many meters will it travel during the first t seconds?

____

6. **(1 pt) pl/setIntegrals15ByParts/ur_in_15_1.pg**
Evaluate the indefinite integral.

$$\int x\arctan(7x)dx$$

____

7. **(1 pt) pl/setIntegrals15ByParts/sc5_6_7.pg**
Use integration by parts to evaluate the integral.

$$\int (\ln(4x))^2dx$$

______________________________ $+C$

8. **(1 pt) pl/setIntegrals15ByParts/bennyparts1.pg**
Evaluate the indefinite integral.

$$\int e^{7x}\sin(7x)dx$$

______________________________ + C

WeBWorK assignment number 04_Techniques is due : 01/27/2010 at 02:00am MST.

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1. **(1 pt) pl/setIntegrals5Trig/ur_in_5_1.pg**
Evaluate the indefinite integral.

$$\int \sin^3(2x)\cos^3(2x)dx$$

________________ $+C$

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2. **(1 pt) pl/setIntegrals5Trig/ur_in_5_2.pg**
Evaluate the indefinite integral.

$$\int 342\cos^4(19x)dx$$

________________ $+C$

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3. **(1 pt) pl/setIntegrals5Trig/sc5_5_99.pg**
Evaluate the indefinite integral.

$$\int 24\cos^3(39x)\,dx$$

____

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4. **(1 pt) pl/setIntegrals5Trig/ur_in_5_3.pg**
Evaluate the indefinite integral.

$$\int \sin(9x)\sin(12x)\;dx$$

____

[NOTE: Remeber to enter all necessary *, (, and) !!
Enter arctan(x) for $\tan^{-1}x$, sin(x) for $\sin x$ ...]

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5. **(1 pt) pl/calculus_and_analytic_geometry_ii/library-/setintegrals25rationalfunctions/nsAP_F_13.pg**
Write out the form of the partial fraction decomposition of the function appearing in the integral:

$$\int \frac{-3x-99}{x^2+3x-18}\,dx$$

Determine the numerical values of the coefficients, A and B, where A $\leq$ B.

$$\frac{A}{denominator}+\frac{B}{denominator}$$

A = ________ B = ________

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6. **(1 pt) pl/setIntegrals25RationalFunctions/ur_in_25_13.pg**
Evaluate the indefinite integral.

$$\int \frac{1}{(x-4)(x+3)}dx$$

____

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7. **(1 pt) pl/setIntegrals25RationalFunctions/pril_pf_1B.pg**
Evaluate the integral.

$$\int_2^3 \frac{3x+4}{x^2+4x+0}dx$$

____

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8. **(1 pt) pl/setIntegrals25RationalFunctions/pril_pf_1.pg**
Evaluate the integral.

$$\int_2^3 \frac{6x+2}{x^2+1x+0}dx$$

____

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1. **(1 pt) pl/setIntegrals16Tables/sc5_7_3.pg**
Use the Table of Integrals in the back of your textbook to evaluate the integral.

$$\int e^{2x} \sin 6x dx$$

____

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2. **(1 pt) pl/setIntegrals16Tables/tab_int_25.pg**
Use the Table of Integrals in the back of your textbook to evaluate the integral.

$$\int \frac{2x dx}{\sqrt{x^4 + 36}}$$

____

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3. **(1 pt) pl/setIntegrals0Theory/sc5_2_3.pg**
Consider the integral

$$\int_5^{11} (2x^2 + 4x + 5)\, dx$$

(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 $n = 3$.
$L_3 =$ ______________________ .

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4. **(1 pt) pl/setIntegrals17Approximations/sc5_8_5.pg**
Approximate the following integral using the methods indicated with $n = 4$ subdivisions. Round your answers to six decimal places.

$$\int_0^1 e^{-5x^2} dx$$

(a) Trapezoidal Rule
$T_4 =$ ______________________

(b) Midpoint Rule
$M_4 =$ ______________________

(c) Simpson's Rule
$S_4 =$ ______________________

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5. **(1 pt) nauLibrary/setCalcII/trapMidSimp.pg**
Use Simpson's Rule, the Midpoint Rule, and the Trapezoid Rule to estimate the value of the integral $\int_{18}^{24} f(x)\, dx$.
In all cases, make n as large as possible, given that this table shows the only values of f that are known.

x	18	19	20	21	22	23	24
f(x)	2.7	3.5	3.7	2.8	2.6	3.4	3.2

Simpson's Rule approximation $S_n =$ ______________________
Midpoint Rule approximation $M_n =$ ______________________
Trapezoid Rule approximation $T_n =$ ______________________

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6. **(1 pt) nauLibrary/setCalcII/trapMidSimp2.pg**
In this problem you will use the midpoint rule, the trapezoid rule, and Simpson's rule to estimate the value of the integral $I = \int_0^{12} \cos(x/5)\, dx$.
Since an antiderivative of the integrand can be found, we would not usually use approximate integration for this integral. But this fact allows us to compute the errors of the various approximation methods.

The exact value of this integral is $I =$ ______. (If you use a calculator, be sure you're in radian mode. You may want to store this result as I for use in later parts of the problem. You can round the answer to 4 significant figures before typing into webwork, but be sure to store the unrounded result.)

The approximation to the integral using the midpoint rule with 2 subdivisions is $M_2 =$ ______. (You may want to store this as M in your calculator.)
The signed error of this approximation is $M_2 - I =$ ______.

The approximation to the integral using the trapezoid rule with 2 subdivisions is $T_2 =$ ______. (You may want to store this as T in your calculator.)
The signed error of this approximation is $T_2 - I =$ ______.

Notice that the signed error of the trapezoid rule is about twice the absolute value of, and has the opposite sign of, the signed error of the midpoint rule. Simpson's rule is the weighted average of the midpoint rule and the trapezoid rule, where the midpoint rule has twice the weight of the trapezoid rule. In general, $S_{2n} = \frac{2}{3}M_n + \frac{1}{3}T_n$. For example, $S_4 = \frac{2}{3}M_2 + \frac{1}{3}T_2$.

The approximation to the integral using Simpson's rule with 4 subdivisions is $S_4 =$ ______. (You may want to store this as S in your calculator.)
The signed error of this approximation is $S_4 - I =$ ______.

Watch for roundoff error. You will need to have very accurate values for S_4 and I in order to get the error $S_4 - I$ accurate to four significant figures. Simpson's rule is very accurate!

7. **(1 pt) nauLibrary/setCalcII/trapSimp2.pg**

Use Simpson's Rule and the Trapezoid Rule to estimate the value of the integral $\int_{-2}^{2}(x^3-3x^2+2x+1)\,dx$.

In both cases, use $n=2$ subdivisions.

Simpson's Rule approximation $S_2 =$ ______

Trapezoid Rule approximation $T_2 =$ ______

Hint: $f(-2)=-23$, $f(0)=1$, and $f(2)=1$ for the integrand f.

Note: Simpson's rule with $n=2$ (or larger) gives the exact value of the integral of a cubic function.

WeBWorK assignment number 06_Improper is due : 02/02/2010 at 06:00pm MST.

1. **(1 pt) pl/setIntegrals18Improper/sc5_9_3a.pg**
Find the area under the curve

$$y = 1.5x^{-2.5}$$

from $x = 7$ to $x = t$ and evaluate it for $t = 10$, $t = 100$.
Then find the total area under this curve for $x \geq 7$.
(a) $t = 10$

______

(b) $t = 100$

______

(c) Total area

______

2. **(1 pt) pl/setIntegrals18Improper/sc5_9_5.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If not, state your answer as "divergent."

$$\int_0^\infty 7e^{-x}dx$$

______

3. **(1 pt) pl/setIntegrals18Improper/sc5_9_11.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\int_{-\infty}^\infty x^6 e^{-x^7}dx$$

______

4. **(1 pt) pl/setIntegrals18Improper/ur_in_18_5.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\int_0^6 \frac{1}{x^{1.2}}dx$$

______

5. **(1 pt) pl/setIntegrals18Improper/sc5_9_21.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\int_2^{10} \frac{1}{(x-3)^3}dx$$

______

6. **(1 pt) pl/setIntegrals18Improper/sc5_9_26.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\int_6^9 \frac{9}{\sqrt[3]{x-6}}dx$$

______

7. **(1 pt) pl/setIntegrals18Improper/sc5_9_16.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If not, state your answer as "divergent."

$$\int_{-\infty}^2 \frac{1}{x^2+1}dx$$

______

8. **(1 pt) pl/setIntegrals18Improper/sc5_9_19.pg**
Determine whether the integral is divergent or convergent. If it is convergent, evaluate it. If not, state your answer as "divergent."

$$\int_4^\infty \frac{\ln(x)}{x}dx$$

______

9. **(1 pt) nauLibrary/setCalcII/comparison.pg**

Use the Comparison Theorem to determine whether the integral is divergent or convergent. If it is convergent, state your answer as "C" (without the quotation marks), but do not attempt to evaluate the integral. If it is divergent, state your answer as "D".

$$\int_1^\infty \frac{dx}{\sqrt{x^3+5}}$$

WARNING: You only get one attempt on this problem.

C or D: ___

10. **(1 pt) pl/setIntegrals18Improper/osu_in_18_8.pg**

Consider the following integrals. Label each as P, C, D, according as the integral is proper, improper but convergent, or improper and divergent.

___1. $\int_{-11\pi}^{36\pi} \sin(x)\tan^{-1}(x)\,dx$

___2. $\int_{-\infty}^{\infty} \frac{x}{x^2+11}\,dx$

___3. $\int_{-\infty}^{\infty} \sin(7x)\,dx$

___4. $\int_{1}^{\infty} se^{-7s^2}\,ds$

___5. $\int_{9}^{19} \ln(x-9)\,dx$

___6. $\int_{0}^{19} \frac{1}{\sqrt[3]{x-9}}\,dx$

___7. $\int_{-\pi/9}^{19\pi/2} \tan^2(7x)\,dx$

___8. $\int_{7}^{\infty} \frac{1}{\sqrt{t^2-49}}\,dt$

WeBWorK assignment number 07_Area is due : 02/10/2010 at 02:00am MST.

1. **(1 pt) pl/setIntegrals19Area/osu_in_19_14.pg**
Consider the area between the graphs $x+3y=11$ and $x+7=y^2$. This area can be computed in two different ways using integrals

First of all it can be computed as a sum of two integrals

$$\int_a^b f(x)\,dx + \int_b^c g(x)\,dx$$

where $a=$ ________, $b=$________, $c=$________ and
$f(x)=$ ____________________
$g(x)=$ ____________________

Alternatively this area can be computed as a single integral

$$\int_\alpha^\beta h(y)\,dy$$

where $\alpha=$ ________, $\beta=$ ________ and
$h(y)=$ ____________________
Either way we find that the area is ________.

2. **(1 pt) pl/setIntegrals19Area/sc6_1_5.pg**
Sketch the region enclosed by $y=3x$ and $y=2x^2$. Decide whether to integrate with respect to x or y. Then find the area of the region.

____

3. **(1 pt) pl/setIntegrals19Area/sc6_1_7.pg**
Sketch the region enclosed by $y=e^{3x}$, $y=e^{5x}$, and $x=1$. Decide whether to integrate with respect to x or y. Then find the area of the region.

____

4. **(1 pt) pl/setIntegrals19Area/sc6_1_12.pg**
Sketch the region enclosed by $x+y^2=6$ and $x+y=0$. Decide whether to integrate with respect to x or y. Then find the area of the region.

____

5. **(1 pt) pl/setIntegrals19Area/ns6_1_99.pg**
Find the area between the curves:
$y=x^3-8x^2+12x$
and $y=-x^3+8x^2-12x$

____

6. **(1 pt) pl/setIntegrals19Area/ns6_1_25.pg**
Find the area of the region enclosed between $y=4\sin(x)$ and $y=2\cos(x)$ from $x=0$ to $x=0.5\pi$.
Hint: Notice that this region consists of two parts.

____

7. **(1 pt) pl/setIntegrals19Area/sc6_1_14.pg**
Sketch the region enclosed by the given curves. Decide whether to integrate with respect to x or y. Then find the area of the region.
$y=8\cos x,\;\; y=(7\sec(x))^2,\;\; x=-\pi/4,\;\; x=\pi/4$

____

8. **(1 pt) pl/setIntegrals19Area/ur_in_19_11.pg**
Sketch the region enclosed by the given curves. Decide whether to integrate with respect to x or y. Then find the area of the region.
$2y=4\sqrt{x}, y=4$, and $2y+4x=8$

____

9. **(1 pt) pl/setIntegrals19Area/ur_in_19_1.pg**
Find $c>0$ such that the area of the region enclosed by the parabolas $y=x^2-c^2$ and $y=c^2-x^2$ is 220.
$c=$ ________

WeBWorK assignment number 08_Volume_Disks is due : 02/12/2010 at 02:00am MST.

---

1. **(1 pt) pl/setIntegrals20Volume/ur_in_20_2.pg**
Find the volume of the solid formed by rotating the region enclosed by
$y = e^{4x} + 4,\ y = 0,\ x = 0,$ and $\ x = 0.9$
about the x-axis.
$V =$ ____________________ .

---

2. **(1 pt) pl/setIntegrals20Volume/sc6_2_1.pg**
Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified axis.

$y = 6x^2, x = 1, y = 0$, about the x-axis

____

---

3. **(1 pt) pl/setIntegrals20Volume/ur_in_20_4.pg**
Find the volume of the solid formed by rotating the region inside the first quadrant enclosed by
$y = x^4$
$y = 125x$
about the x-axis.

____

---

4. **(1 pt) pl/setIntegrals20Volume/sc6_2_9.pg**
Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified axis.

$y = x^2, y = 1;$ about $y = 6$

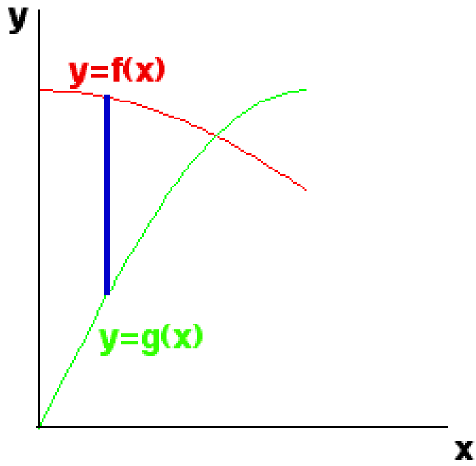
____

---

5. **(1 pt) pl/setIntegrals20Volume/ns6_2_11.pg**
Find the volume formed by rotating the region enclosed by:
$x = 3y$ and $y^3 = x$ with $y \geq 0$
about the y-axis

____

1. **(1 pt) pl/setIntegrals20Volume/osu_in_20_1/osu_in_20_1.pg**



Consider the blue vertical line shown above (click on graph for better view) connecting the graphs $y = g(x) = \sin(2x)$ and $y = f(x) = \cos(3x)$.
Referring to this blue line, match the statements below about rotating this line with the corresponding statements about the result obtained.

___1. The result of rotating the line about the x-axis is
___2. The result of rotating the line about the y-axis is
___3. The result of rotating the line about the line $y = 1$ is
___4. The result of rotating the line about the line $x = -2$ is
___5. The result of rotating the line about the line $x = \pi$ is
___6. The result of rotating the line about the line $y = -2$ is
___7. The result of rotating the line about the line $y = \pi$
___8. The result of rotating the line about the line $y = -\pi$

A. a cylinder of radius $x+2$ and height $\cos(3x) - \sin(2x)$
B. an annulus with inner radius $\sin(2x)$ and outer radius $\cos(3x)$
C. an annulus with inner radius $\pi + \sin(2x)$ and outer radius $\pi + \cos(3x)$
D. an annulus with inner radius $\pi - \cos(3x)$ and outer radius $\pi - \sin(2x)$
E. a cylinder of radius $\pi - x$ and height $\cos(3x) - \sin(2x)$
F. a cylinder of radius x and height $\cos(3x) - \sin(2x)$
G. an annulus with inner radius $1 - \cos(3x)$ and outer radius $1 - \sin(2x)$ is
H. an annulus with inner radius $2 + \sin(2x)$ and outer radius $2 + \cos(3x)$

2. **(1 pt) pl/setIntegrals20Volume/ur_in_20_3.pg**
Find the volume of the solid formed by rotating the region enclosed by
$y = e^x + 4$, $y = 0$, $x = 0$, and $x = 0.7$
about the y-axis.
$V =$ ____________ .

3. **(1 pt) pl/setIntegrals20Volume/osu_in_20_10.pg**
The region between the graphs of $y = x^2$ and $y = 3x$ is rotated around the line $x = 3$.
The volume of the resulting solid is ______

4. **(1 pt) pl/setIntegrals20Volume/mec1.pg**
Find the volume of a pyramid with height 17 and rectangular base with dimensions 3 and 12.

______

5. **(1 pt) pl/setIntegrals20Volume/osu_in_20_8.pg**
The base of a certain solid is the triangle with vertices at $(-6,3)$, $(3,3)$, and the origin. Cross-sections perpendicular to the y-axis are squares.
Then the volume of the solid is ______.

6. **(1 pt) pl/setIntegrals20Volume/sc6_3_99.pg**
Find the volume of the solid obtained by rotating the region bounded by the curves
$y = 3x - 3x^2$ and $y = 0$
about the y-axis

$V =$ ____________ .

7. **(1 pt) pl/setIntegrals20Volume/ur_in_20_6.pg**
Find the volume of the solid obtained by rotating the region bounded by the curve $y = \sin(6x^2)$ and the x-axis, $0 \le x \le \sqrt{\frac{\pi}{6}}$, about the y-axis.
$V =$ ____________

WeBWorK assignment number 10_Length_Ave is due : 02/19/2010 at 02:00am MST.

1. **(1 pt) pl/setIntegrals21Length/ur_in_21_1.pg**
To find the length of the curve defined by

$$y = 6x^2 + 12x$$

from the point (-2,0) to the point (2,48), you'd have to compute

$$\int_a^b f(x)dx$$

where a=_____,
b=_____,
and f(x) = ____________________

2. **(1 pt) pl/setIntegrals21Length/ur_in_21_2.pg**
Find the length of the curve defined by

$$y = 5x^{3/2} + 11$$

from $x = 4$ to $x = 10$.

____

3. **(1 pt) nauLibrary/setCalcII/catenary.pg**
A cable hangs between two poles of equal height and 28 feet apart. Set up a coordinate system where the poles are placed at $x = -14$ and $x = 14$, where x is measured in feet. The height (in feet) of the cable at position x is

$$h(x) = 7\cosh(x/7),$$

where $\cosh(x) = (e^x + e^{-x})/2$ is the hyperbolic cosine, which is an important function in physics and engineering.
The cable is __________ feet long.

4. **(1 pt) pl/setIntegrals22Average/osu_in_22_4.pg**
Find the mean value of the function $f(x) = |8 - x|$ on the closed interval $[7, 9]$.
mean value = __________

5. **(1 pt) pl/setIntegrals22Average/ur_in_22_1.pg**
A car drives down a road in such a way that its velocity (in m/s) at time t (seconds) is

$$v(t) = 1t^{1/2} + 4$$

.
Find the car's average velocity (in m/s) between $t = 2$ and $t = 7$.

____

6. **(1 pt) pl/setIntegrals22Average/ur_in_22_11.pg**
In a certain city the temperature (in degrees Fahrenheit) t hours after 9am was approximated by the function

$$T(t) = 70 + 5\sin\left(\frac{\pi t}{12}\right)$$

Determine the temperature at 9 am. _____
Determine the temperature at 3 pm. _____

Find the average temperature during the period from 9 am to 9 pm. ____________________

7. **(1 pt) pl/setIntegrals22Average/ur_in_22_3.pg**
Find the average value of : $f(x) = 8\sin x + 7\cos x$
on the interval $[0, 14\pi/6]$

Average value = ____________________________

---

1. **(1 pt) pl/setIntegrals27SurfaceArea/ur_in_27_1.pg**
Find the area of the surface obtained by rotating the curve

$$y = 6x^3$$

from $x = 0$ to $x = 6$ about the x-axis.

____

---

2. **(1 pt) pl/setIntegrals27SurfaceArea/ur_in_27_2.pg**
Find the area of the surface obtained by rotating the curve

$$y = \sqrt{3x}$$

from $x = 0$ to $x = 3$ about the x-axis.

____

---

3. **(1 pt) pl/setIntegrals23Work/eva5_1.pg**
The force on a particle is described by $7x^3 - 4$ at a point x along the x-axis. Find the work done in moving the particle from the origin to $x = 7$. ____________________

---

4. **(1 pt) pl/setIntegrals23Work/eva5_2.pg**
A force of 4 pounds is required to hold a spring stretched 0.5 feet beyond its natural length. How much work (in foot-pounds) is done in stretching the spring from its natural length to 1.1 feet beyond its natural length? ____________________

---

5. **(1 pt) pl/setIntegrals23Work/eva6_1.pg**
A tank in the shape of an inverted right circular cone has height 10 meters and radius 13 meters. It is filled to a depth of 5 meters with hot chocolate.
Find the work required to empty the tank by pumping the hot chocolate over the top of the tank. Note: the density of hot chocolate is $\delta = 1490 kg/m^3$

____

---

6. **(1 pt) pl/setIntegrals23Work/lanpril_7_8.pg**
A trough is 3 feet long and 1 foot high. The vertical cross-section of the trough parallel to an end is shaped like the graph of $y = x^4$ from $x = -1$ to $x = 1$. The trough is full of water. Find the amount of work in foot-pounds required to empty the trough by pumping the water over the top. Note: The weight of water is 62 pounds per cubic foot.

____

---

7. **(1 pt) pl/setIntegrals23Work/lanpril_7_8a.pg**
A trough is 7 meters long, 1 meters wide, and 1 meters deep. The vertical cross-section of the trough at the top parallel to an end is shaped like an isoceles triangle (with height 1 meters, and base, on top, of length 1 meters). The trough is full of water (density $1000 kg/m^3$). Find the amount of work in joules required to empty the trough by pumping the water over the top. (Note: Use $g = 9.8 m/s^2$ as the acceleration due to gravity.)

____

---

8. **(1 pt) pl/setIntegrals23Work/ur_in_23_11.pg**
A circular swimming pool has a diameter of 14 m, the sides are 3 m high, and the depth of the water is 1.5 m. How much work (in Joules) is required to pump all of the water over the side? (The acceleration due to gravity is 9.8 m/s^2 and the density of water is 1000 kg/m^3.)

____

---

9. **(1 pt) pl/setIntegrals23_5Pressure/benny14.pg**
The Deligne Dam on the Cayley River is built so that the wall facing the water is shaped like the region above the curve $y = 0.4x^2$ and below the line $y = 120$. (Here, distances are measured in meters.) The water level is 34 meters below the top of the dam. Find the force (in Newtons) exerted on the dam by water pressure. (Water has a density of $1000 kg/m^3$, and the acceleration of gravity is $9.8 m/sec^2$.)

____

---

10. **(1 pt) pl/setIntegrals23_5Pressure/ur_in_23_5_1.pg**
An aquarium 9 m long, 5 m wide, and 2 m deep is full of water. Find the following:
the hydrostatic pressure on the bottom of the aquarium ____________________,
the hydrostatic force on the bottom of the aquarium ____________________,
the hydrostatic force on one end of the aquarium ____________________.

1. **(1 pt) pl/setDiffEQ1/e7_1_2.pg**
Match each differential equation to a function which is a solution.
FUNCTIONS
A. $y = 3x + x^2$,
B. $y = e^{-3x}$,
C. $y = \sin(x)$,
D. $y = x^{\frac{1}{2}}$,
E. $y = 6\exp(6x)$,
DIFFERENTIAL EQUATIONS

___1. $y'' + 10y' + 21y = 0$
___2. $y' = 6y$
___3. $y'' + y = 0$
___4. $2x^2y'' + 3xy' = y$

2. **(1 pt) pl/setDiffEQ1/e7_1_3.pg**
It is easy to check that for any value of c, the function

$$y = ce^{-2x} + e^{-x}$$

is solution of equation

$$y' + 2y = e^{-x}.$$

Find the value of c for which the solution satisfies the initial condition $y(-5) = 1$.
$c =$ __________

3. **(1 pt) pl/setDiffEQ1/e7_1_4.pg**
It is easy to check that for any value of c, the function

$$y = x^2 + \frac{c}{x^2}$$

is solution of equation

$$xy' + 2y = 4x^2,\ (x > 0).$$

Find the value of c for which the solution satisfies the initial condition $y(2) = 6$.
$c =$ __________

4. **(1 pt) pl/setDiffEQ1/e7_1_5.pg**
Find the two values of k for which

$$y(x) = e^{kx}$$

is a solution of the differential equation

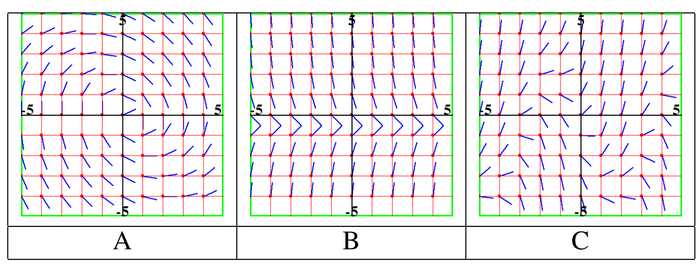
$$y'' - 10y' + 24y = 0.$$

smaller value = ____
larger value = ____

5. **(1 pt) pl/setDiffEQ2DirectionFields/ur_de_2_1/ur_de_2_1.pg**
Match the following differential equations with their slope field. (Note: The line segment just extends to one side of the dot at which the slope is calculated.) Clicking on each picture will give you an enlarged view. While you can probably solve this problem by guessing, it is useful to try to predict characteristics of the direction field and then match them to the picture. Here are some handy characteristics to start with – you will develop more as you practice.

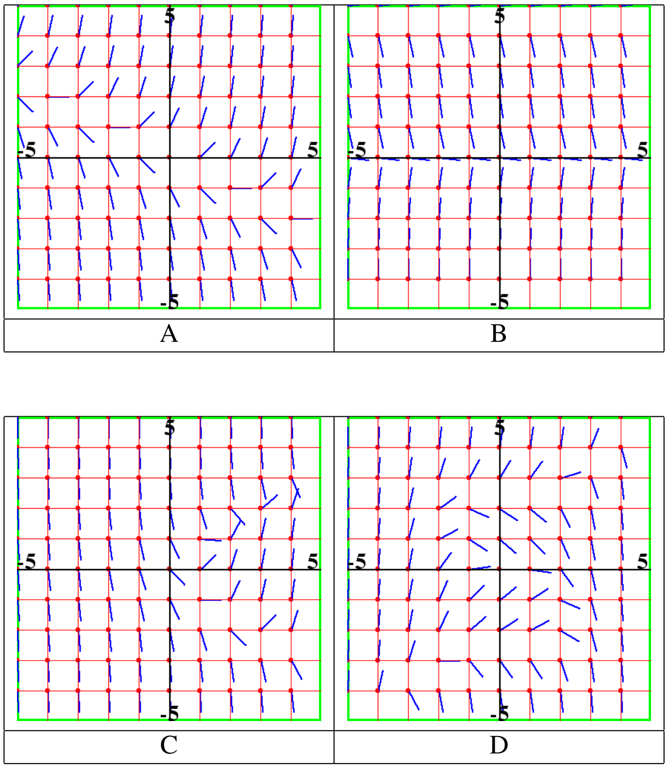
A. Set y equal to zero and look at how the derivative behaves along the x-axis.
B. Do the same for the y-axis by setting x equal to 0
C. Consider the curve in the plane defined by setting $y' = 0$ – this should correspond to the points in the picture where the slope is zero.
D. Setting y' equal to a constant other than zero gives the curve of points where the slope is that constant. These are called isoclines, and can be used to construct the direction field picture by hand.

___1. $y' = 3\sin(x) + 1 + y$
___2. $y' = -\frac{(2x + y)}{(2y)}$
___3. $y' = -1 - 2y$



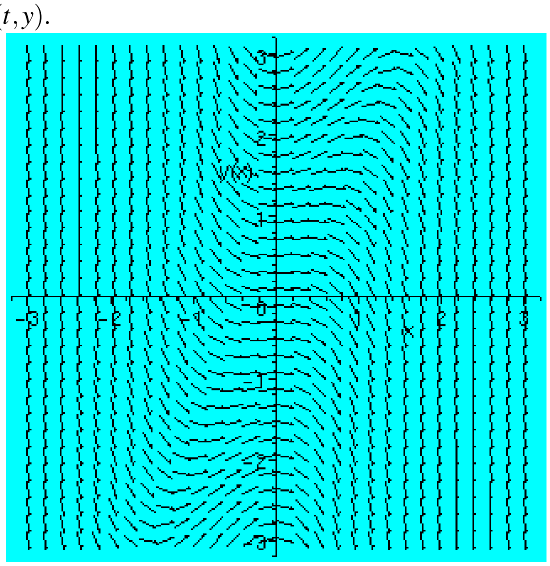
6. **(1 pt) pl/setDiffEQ2DirectionFields/ur_de_2_2/ur_de_2_2.pg**
This problem is harder. Study the previous problem, if you are having trouble.
Match the following differential equations with their slope field. Clicking on each picture will give you an enlarged view.

___1. $y' = x + 2y$
___2. $y' = -y(5 - y)$
___3. $y' = \frac{y^3}{6} - y - \frac{x^3}{6}$
___4. $y' = 2x - 1 - y^2$



7. **(1 pt) pl/setStewartCh10S2/problem_2a.pg**

Consider the slope field of some differential equation $\frac{dy}{dt} = F(t,y)$.



Suppose that $y(0) = 1.8$. Then y(2) is closest to which value?

- A. 0
- B. 1
- C. -2
- D. -1
- E. -3
- F. 3
- G. 2

8. **(1 pt) pl/setStewartCh10S1/problem_3.pg**

The function $y(t)$ satisfies the differential equation

$$\frac{dy}{dt} = y^4 + 3y^3 - 70y^2$$

List the (distinct) constant solutions $(y = c)$ to the differential equation in ascending order. (If there are fewer than four solutions, leave the latter blanks empty)

____ ____ ____ ____

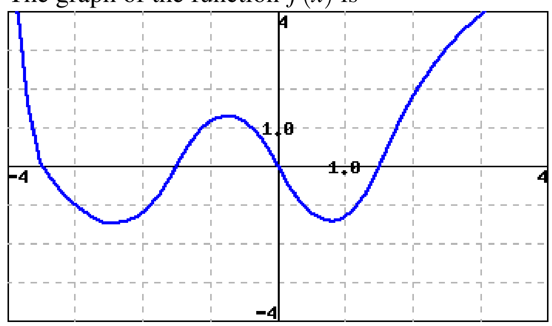
For what values of y (in interval notation) is y increasing? Use the strings "plus_infinity" or "minus_infinity" if appropriate, and if there is only one interval, leave the second one blank. Finally, list your intervals so that the first interval is to the left of the second (on the real line).

Interval 1: (______,______)

Interval 2:(______,______)

9. **(1 pt) pl/setDiffEQ6AutonomousStability/ur_de_6_1a.pg**

The graph of the function $f(x)$ is



The horizontal axis is x, and the vertical axis is $f(x)$.

Consider the differential equation $x'(t) = f(x(t))$, which can also be written as $\frac{dx}{dt} = f(x)$.

List the constant (or equilibrium) solutions to this differential equation in increasing order and indicate whether these solutions are stable or unstable.

$x =$ ___ is [?].

$x =$ ___ is [?].

$x =$ ___ is [?].

$x =$ ___ is [?].

10. **(1 pt) pl/setDiffEQ2DirectionFields/ur_de_2_5.pg**

Use Euler's method with step size 0.5 to compute the approximate y-values y_1, y_2, y_3, and y_4 of the solution of the initial-value problem

$$y' = -2 + 5x - 2y, \quad y(1) = -2.$$

$y_0 = -2$,

$y_1 =$ _____,

$y_2 =$ _____,

$y_3 =$ _____,

$y_4 =$ _____.

---

11. **(1 pt) pl/setDiffEQ2DirectionFields/ur_de_2_6_20steps.pg**
Use Euler's method with step size 0.15 to estimate $y(3)$, where $y(x)$ is the solution of the initial-value problem

$$y' = -3x + \sin(y), \quad y(0) = -1.$$

$y(3) =$ _____.
Be sure to use radians, not degrees.

---

12. **(1 pt) pl/setStewartCh10S2/problem_3a.pg**
A cup of coffee at 85 degrees Celsius is placed in a room at 20 degrees Celsius. Suppose that the coffee cools at a rate of 3 degrees Celsius per minute when the temperature of the coffee is 70 degrees. The differential equation describing this has the form $\frac{dT}{dt} = k(T - A)$, where
$A =$ __________, and
$k =$ __________.
Answer the next question either from the slope field (drawn by computer or by hand) or using other intuitive means. Do not attempt to solve the DE analytically.
The limiting value of T, as $t \to \infty$, is __________

WeBWorK assignment number 13_Separable_DEs is due : 03/05/2010 at 02:00am MST.

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1. **(1 pt) pl/setDiffEQ3Separable/ns7_4_13a.pg**
Find an equation of the curve that satisfies

$$\frac{dy}{dx} = 80yx^7$$

and whose y-intercept is 6.
$y(x) =$ ______________.

---

2. **(1 pt) pl/setDiffEQ3Separable/ur_de_3_6.pg**
A. Find y in terms of x if

$$\frac{dy}{dx} = x^6y^{-7}$$

and $y(0) = 2$.

$y(x) =$ ______________.

B. For what x-interval is the solution defined?
(Your answers should be numbers or plus or minus infinity. For plus infinity enter "PINF"; for minus infinity enter "MINF".)

The solution is defined on the interval:
_______ $< x <$ _______.

---

3. **(1 pt) pl/setDiffEQ3Separable/osu_de_3_11.pg**
Find the particular solution of the differential equation

$$\frac{dy}{dx} = (x-8)e^{-2y}$$

satisfying the initial condition $y(8) = \ln(8)$.
Answer: $y =$ ______________.
Your answer should be a function of x.

---

4. **(1 pt) pl/setDiffEQ3Separable/jas7_4_5b.pg**
Solve the separable differential equation for u

$$\frac{du}{dt} = e^{4u+10t}.$$

Use the following initial condition: $u(0) = -4$.
$u =$ ______________.

---

5. **(1 pt) pl/setDiffEQ3Separable/ns7_4_3.pg**
Find a function y of x such that

$$5yy' = x \text{ and } y(5) = 9.$$

$y =$ ______________.

---

6. **(1 pt) pl/setDiffEQ3Separable/ns7_4_8b.pg**
Find the function $y = y(x)$ (for $x > 0$) which satisfies the separable differential equation

$$\frac{dy}{dx} = \frac{8+11x}{xy^2}; \quad x > 0$$

with the initial condition $y(1) = 2$.
$y =$ ______________.

---

7. **(1 pt) pl/setDiffEQ3Separable/ur_de_3_13.pg**
Solve the separable differential equation

$$\frac{dy}{dt} = -4y^4,$$

and find the particular solution satisfying the initial condition

$$y(0) = -1.$$

$y(t) =$ ______________.

HINTS: Use fractional exponents to take roots. For example the 7'th root of x is written as x^(1/7) in WeBWorK (and on your calculator).

If you are one of those lucky people with $y(0) < 0$, be aware that you must express your function $y(t)$ in such a way that WeBWorK raises a POSITIVE base to an exponent when $t = 0$. Webwork does not allow (-4)^(1/2), which is undefined, but it also does not allow (-8)^(1/3), which we humans know is defined and equal to -2.

---

8. **(1 pt) pl/setDiffEQ3Separable/ur_de_3_2.pg**
The differential equation

$$\frac{dy}{dx} = \cos(x)\frac{y^2+6y+8}{6y+20}$$

has an implicit general solution of the form $F(x,y) = K$.

In fact, because the differential equation is separable, we can define the solution curve implicitly by a function in the form

$$F(x,y) = G(x) + H(y) = K.$$

Find such a solution and then give the related functions requested.
$F(x,y) = G(x) + H(y) =$

______________________________ .

Professor Swift **JSwift_137**

WeBWorK assignment number 14_DE_Modeling is due : 03/09/2010 at 02:00am MST.

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1. **(1 pt) nauLibrary/setCalcII/introModeling1stOrderDE.pg**
Many modeling applications of differential equations use the initial value problem (IVP)

$$\frac{dy}{dt} = k(y - A), \qquad y(0) = y_0 ,$$

where k, A, and y_0 are constants. The IVP has the solution

$$y(t) = A + (y_0 - A)e^{kt}.$$

You should memorize this solution and be able to write it down "by inspection". The solution makes sense because $y(t) = A$ is an equilibrium solution which is stable if $k < 0$ and unstable if $k > 0$.

The case with $A = 0$ is a very important special case: The IVP

$$\frac{dy}{dt} = ky, \qquad y(0) = y_0 ,$$

has the solution

$$y(t) = y_0 e^{kt}.$$

Practice by solving the following IVP by inspection:

$$\frac{dy}{dt} = 4y + 5, \qquad y(0) = 4 ,$$

This IVP fits the standard pattern with $k =$ ___, $A =$ ___, and $y_0 =$ ___. Therefore, the solution to the IVP is
$y(t) =$ ____________.

---

2. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ns7_4_31f.pg**
A tank contains 1600 L of pure water. A solution that contains 0.03 kg of sugar per liter enters tank at the rate 2 L/min. The solution is mixed and drains from the tank at the same rate.

Let $S(t)$ representing the amount of sugar (in kg) in the tank at time t (in minutes) after the solution starts being pumped in.

(a) How much sugar (in kg) is in the tank at the beginning.
$S(0) =$ ___.

(b) Write the differential equation which models this situation.
$\frac{dS}{dt} =$ __________.

Note: Make sure you use a capital S. (Don't use S(t), it confuses the computer). The units of $\frac{dS}{dt}$ are kg/min, but don't enter the units for this answer.

(c) Now, factor out the coefficient of S in your answer above, and fill in the constants in the two blanks:
$\frac{dS}{dt} =$ ___ $(S-$ ___ $)$.

(d) Find the amount of sugar (in kg) after t minutes.
$S(t) =$ ____________. (This answer is a function of t.)

(e) Find the amount of sugar (in kg) after a very long time.
That is, $\lim_{t\to\infty} S(t) =$ ___.

---

3. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ns7_5_10.pg**
An unknown radioactive element decays into non-radioactive substances. In 340 days the radioactivity of a sample decreases by 33 percent.

(a) What is the half-life of the element?
half-life: ____________ (days)

(b) How long will it take for a sample of 100 mg to decay to 51 mg?
time needed: ________________ (days)

---

4. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ns7_5_3.pg**
A bacteria culture starts with 600 bacteria and grows at a rate proportional to its size. After 2 hours there will be 1200 bacteria.

(a) Express the population after t hours as a function of t.
population: ________________ (function of t)

(b) What will be the population after 5 hours?
____

(c) How long will it take for the population to reach 2430 ?
____

---

5. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ur_de_5_1.pg**
A young person with no initial capital invests k dollars per year in a retirement account at an annual rate of return 0.06. Assume that investments are made continuously and that the return is compounded continuously.

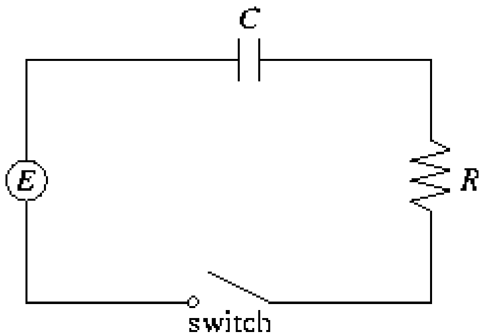
Determine a formula for the sum $S(t)$ – (this will involve the parameter k):
$S(t) =$ ________________________

What value of k will provide 1701000 dollars in 50 years?
$k =$ ________________

---

6. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ur_de_5_4.pg**
Newton's law of cooling states that the temperature of an object changes at a rate proportional to the difference between its temperature and that of its surroundings. Suppose that the temperature of a cup of coffee obeys Newton's law of cooling. If the coffee has a temperature of 200 degrees Fahrenheit when freshly poured, and 1 minutes later has cooled to 186 degrees in a room at 78 degrees, determine when the coffee reaches a temperature of 156 degrees.
The coffee will reach a temperature of 156 degrees in __________ minutes.

7. **(1 pt) pl/setDiffEQ5ModelingWith1stOrder/ur_de_5_17.pg**



The figure above shows a circuit containing an electromotive force, a capacitor with a capacitance of C farads (F), and a resistor with a resistance of R ohms Ω. The voltage drop across the capacitor is Q/C, where Q is the charge (in coulombs), so in this case Kirchhoff's Law gives

$$RI + \frac{Q}{C} = E(t).$$

Since $I = \frac{dQ}{dt}$, we have

$$R\frac{dQ}{dt} + \frac{1}{C}Q = E(t).$$

Suppose the resistance is $20\,\Omega$, the capacitance is 0.15F, a battery gives a constant voltage of 60V, and the initial charge is $Q(0) = 0$C.
Find the charge and the current at time t.
$Q(t) =$ ____________________,
$I(t) =$ ____________________.

1. **(1 pt) pl/setSequences4Arithmetic/ur_sq_4_1.pg**
Write down the first five terms of the sequence $\left\{\frac{2n}{n+2}\right\}$
___, ___, ___, ___, ___,

2. **(1 pt) pl/setSequences4Arithmetic/ur_sq_4_9.pg**
Write down the first five terms of the following recursively defined sequence.

$$a_1 = -2; \;\; a_{n+1} = -2a_n - 5$$

___, ___, ___, ___, ___

3. **(1 pt) pl/setSequences1Definitions/ns8_1_5.pg**
For each sequence, find a formula for the general term, a_n. For example, answer n^2 if given the sequence:
$\{1,4,9,16,25,36,...\}$
___1. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots$
___2. $\frac{3}{16}, \frac{4}{25}, \frac{5}{36}, \frac{6}{49}, \ldots$

4. **(1 pt) pl/setSequences3Monotone/ns8_1_38.pg**
Determine whether the sequences are increasing, decreasing, or not monotonic. If increasing, enter 1 as your answer. If decreasing, enter -1as your answer. If not monotonic, enter 0 as your answer.

___1. $a_n = \frac{n-5}{n+5}$
___2. $a_n = \frac{1}{5n+6}$
___3. $a_n = \frac{\cos n}{5^n}$
___4. $a_n = \frac{\sqrt{n+5}}{6n+5}$

5. **(1 pt) pl/setSequenceandSeries/jj4.pg**
Determine whether each sequence is geometric or not. If it is geometric, enter the common ratio in the blank provided. If it is not geometric, enter *None* in the answer blank.

(a) $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \ldots$

Common ratio (or *None*) = ____________

(b) 8, -4, 2, -1, . . .

Common ratio (or *None*) = ____________

(c) 3, $\frac{3}{2}, \frac{3}{4}, \frac{3}{8}, \ldots$

Common ratio (or *None*) = ____________

6. **(1 pt) pl/setSequences2Limits/ur_sq_2_11.pg**
Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\lim_{n\to\infty} \frac{8n^3 + \sin^2(7n)}{n^2 + 11}$$

____

7. **(1 pt) pl/setSequenceandSeries/factorial3.pg**
Simplify the expression

$$\frac{(3n+4)!}{(3n-3)!}$$

.
$\frac{(3n+4)!}{(3n-3)!}$= ____________

8. **(1 pt) pl/setSequences2Limits/ur_sq_2_16.pg**
Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\lim_{n\to\infty} \frac{-4(n!)}{(-2)^n}$$

____

9. **(1 pt) pl/setSequences2Limits/ns8_1_11.pg**
Find the limit of the sequence:
$a_n = \frac{1n^2+9n+7}{4n^2+2n+8}$
____

10. **(1 pt) pl/setSequences2Limits/ns8_1_25.pg**
Find the limit of the sequence $a_n = \frac{(\cos n)}{2^n}$.
____

11. **(1 pt) pl/setSequences2Limits/ur_sq_2_24.pg**
Match each sequence below to statement that BEST fits it.

STATEMENTS

Z. The sequence converges to zero; I. The sequence diverges to positive infinity;
F. The sequence has a finite non-zero limit; D. The sequence diverges, but not to infinity.

SEQUENCES

___1. $\cos^2(n)+\sin^2(n)$
___2. $\frac{(-5)^n}{n!}$
___3. $\sqrt{n^2+4n}-\sqrt{n^2}$
___4. $\left(5n^{2n}\right)^{1/n}$
___5. $(-1)^{-n}\,\frac{2n}{\ln(n)}$
___6. $\frac{100n^2+1}{3n!}$
___7. $\frac{5^n}{n!}$
___8. $\left(\frac{e}{10}\right)^n$

WeBWorK assignment number 16_Series is due : 03/29/2010 at 02:00am MST.

---

1. **(1 pt) pl/setSeries1Definitions/ur_sr_1_1.pg**

Let

$$s_k = \sum_{n=1}^{k} n(.1)^n$$

Find s_3.

$s_3 =$ ______

---

2. **(1 pt) pl/setSeries1Definitions/ur_sr_1_4.pg**

Consider the series $\sum_{n=1}^{\infty} \frac{9}{n+3}$. Let s_n be the n-th partial sum; that is,

$$s_n = \sum_{i=1}^{n} \frac{9}{i+3}.$$

Find s_4 and s_8

$s_4 =$ ______

$s_8 =$ ______

---

3. **(1 pt) pl/setSeries1Definitions/ur_sr_1_3.pg**

Let $r = \frac{15}{21}$.

For both of the following answer blanks, decide whether the given sequence or series is convergent or divergent. If convergent, enter the limit (for a sequence) or the sum (for a series). If divergent, enter INF if it diverges to infinity, MINF if it diverges to minus infinity, or DIV otherwise.

A. Consider the sequence $\{nr^n\}$.

$\lim_{n\to\infty} nr^n =$ ______

B. Take my word for it that it can be shown that

$$\sum_{i=1}^{n} ir^i = \frac{nr^{n+2} - (n+1)r^{n+1} + r}{(1-r)^2}.$$

Now consider the series $\sum_{n=1}^{\infty} nr^n$.

$\sum_{n=1}^{\infty} nr^n =$ ______

---

4. **(1 pt) pl/setSeries1Definitions/ur_sr_1_2.pg**

Let a_n be the n th digit after the decimal point in $5\pi + 4e$. Evaluate

$$\sum_{n=1}^{\infty} a_n(.1)^n.$$

______

---

5. **(1 pt) pl/setSeries3Convergent/ns8_2_9.pg**

Given:

$A_n = \frac{2n}{-4n+3}$

For both of the following answer blanks, decide whether the given sequence or series is convergent or divergent. If convergent, enter the limit (for a sequence) or the sum (for a series). If divergent, enter INF if it diverges to infinity, MINF if it diverges to minus infinity, or DIV otherwise.

(a) The series $\sum_{n=1}^{\infty}(A_n)$. ______

(b) The sequence $\{A_n\}$. ______

---

6. **(1 pt) pl/setSeries2Telescope/ns8_2_26.pg**

If the following series converges, compute its sum. Otherwise, enter INF if it diverges to infinity, MINF if it diverges to minus infinity, and DIV otherwise.

$$\sum_{n=1}^{\infty}\left(e^{-2n} - e^{-2(n+1)}\right)$$

______

---

7. **(1 pt) pl/setSeries2Telescope/ns8_2_21.pg**

If the following series converges, compute its sum. Otherwise, enter INF if it diverges to infinity, MINF if it diverges to minus infinity, and DIV otherwise.

$$\sum_{n=1}^{\infty} \frac{6}{n(n+2)}$$

______

(Hint: try breaking the summands up partial fractions-style.)

---

8. **(1 pt) nauLibrary/setCalcII/finiteGeometric.pg**

Determine the sum of the following finite geometric series.

$\sum_{n=0}^{20} 5 \cdot (-2)^n =$ ______

---

9. **(1 pt) pl/setSeries4Geometric/ur_sr_4_1.pg**

The following series are either geometric, or the sum of two geometric series.

Determine whether each series converges or not.

For the series which converge, enter the sum of the series. For the series which diverges enter "DIV" (without quotes).

(a) $\sum_{n=1}^{\infty} \frac{9^n}{8^n} =$ ______,

(b) $\sum_{n=2}^{\infty} \frac{1}{3^n} =$ ______,

(c) $\sum_{n=0}^{\infty} \frac{3^n}{5^{2n+1}} =$ ______,

(d) $\sum_{n=5}^{\infty} \frac{8^n}{9^n} =$ ________,

(e) $\sum_{n=1}^{\infty} \frac{7^n}{7^{n+4}} =$ ________,

(f) $\sum_{n=1}^{\infty} \frac{8^n + 3^n}{9^n} =$ ________.

10. **(1 pt) pl/setSeries4Geometric/ur_sr_4_11b.pg**
Express 5.603603603... as a rational number in the form $\frac{p}{q}$, where p and q have no common factors.
p = _____ and q = _____

11. **(1 pt) pl/setSequenceandSeries/jj12a.pg**
Find the sum of the geometric series.

$$1 - \frac{1}{3} + \frac{1}{9} - \frac{1}{27} + \cdots = \text{\_\_\_\_\_\_\_\_}$$

Enter *DNE* if the series diverges.

12. **(1 pt) pl/setSeries4Geometric/ur_sr_4_15.pg**
A ball drops from a height of 25 feet. Each time it hits the ground, it bounces up 55 percent of the height it falls. It can be shown that the ball makes an infinite number of bounces in a finite time, before coming to rest. Find the total distance the ball has traveled when it comes to rest.

The ball travels ________ feet.

---

1. **(1 pt) pl/setSeries5IntegralTest/eva8_3_3.pg**

Find the value of

$$\int_2^\infty \frac{dx}{(3x-2)^4}$$

____

Determine whether
$\sum_{n=2}^{\infty}(\frac{1}{(3n-2)^4})$
Enter C if series is convergent, D if series is divergent. ___

---

2. **(1 pt) pl/setSeries5IntegralTest/ur_sr_5_13.pg**

Find the value of $\int_1^\infty 6x^2e^{-x^3}$

____

Determine whether $\sum_{n=1}^{\infty}(6n^2e^{-n^3})$
converges. Enter C if series is convergent, D if series is divergent. ___

---

3. **(1 pt) pl/setSeries5IntegralTest/ns8_3_24eva.pg**

(a) Compute s_5 (the 5th partial sum) of $s = \sum_{n=1}^{\infty}\frac{5}{10n^3}$

____

(b) Estimate the error in using s_5 as an approximation of the sum of the series. (i.e. use $\int_5^\infty f(x)dx \geq R_5$)

____

(c) Use n = 5 and

$$s_n + \int_{n+1}^\infty f(x)dx \leq s \leq s_n + \int_n^\infty f(x)dx$$

to find a better estimate of the sum.

__________ $\leq s \leq$ __________

---

4. **(1 pt) Library/maCalcDB/setSeries6CompTests/benny_ser3B.pg**

Each of the following statements is an attempt to show that a given series is convergent or divergent using the Comparison Test (NOT the Limit Comparison Test.) For each statement, enter V (for "valid") if the argument is valid, or enter I (for "invalid") if any part of the argument is flawed. (Note: if the conclusion is true but the argument that led to it was wrong, you must enter I.)

___1. For all $n > 2$, $\frac{n}{n^3-8} < \frac{2}{n^2}$, and the series $2\sum\frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum\frac{n}{n^3-8}$ converges.

___2. For all $n > 1$, $\frac{\sin^2(n)}{n^2} < \frac{1}{n^2}$, and the series $\sum\frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum\frac{\sin^2(n)}{n^2}$ converges.

___3. For all $n > 2$, $\frac{\sqrt{n+1}}{n} > \frac{1}{n}$, and the series $\sum\frac{1}{n}$ diverges, so by the Comparison Test, the series $\sum\frac{\sqrt{n+1}}{n}$ diverges.

___4. For all $n > 1$, $\frac{\arctan(n)}{n^3} < \frac{\pi}{2n^3}$, and the series $\frac{\pi}{2}\sum\frac{1}{n^3}$ converges, so by the Comparison Test, the series $\sum\frac{\arctan(n)}{n^3}$ converges.

___5. For all $n > 2$, $\frac{1}{n^2-1} < \frac{1}{n^2}$, and the series $\sum\frac{1}{n^2}$ converges, so by the Comparison Test, the series $\sum\frac{1}{n^2-1}$ converges.

___6. For all $n > 1$, $\frac{1}{n\ln(n)} < \frac{2}{n}$, and the series $2\sum\frac{1}{n}$ diverges, so by the Comparison Test, the series $\sum\frac{1}{n\ln(n)}$ diverges.

---

5. **(1 pt) pl/setSeries6CompTests/benny_ser4B.pg**

The three series $\sum A_n$, $\sum B_n$, and $\sum C_n$ have terms

$$A_n = \frac{1}{n^9}, \quad B_n = \frac{1}{n^2}, \quad C_n = \frac{1}{n}.$$

Use the Limit Comparison Test to compare the following series to any of the above series. For each of the series below, you must enter two letters. The first is the letter (A,B, or C) of the series above that it can be legally compared to with the Limit Comparison Test. The second is C if the given series converges, or D if it diverges. So for instance, if you believe the series converges and can be compared with series C above, you would enter CC; or if you believe it diverges and can be compared with series A, you would enter AD.

___1. $\sum_{n=1}^{\infty}\frac{4n^5+n^2-4n}{6n^{14}-5n^{11}+7}$

___2. $\sum_{n=1}^{\infty}\frac{2n^2+n^9}{1309n^{11}+6n^2+5}$

___3. $\sum_{n=1}^{\infty}\frac{5n^2+4n^8}{2n^9+6n^3-2}$

---

6. **(1 pt) pl/setSeries3Convergent/ns8_3_7.pg**

Match each of the following with the correct statement.
C stands for Convergent, D stands for Divergent.

___1. $\sum_{n=2}^{\infty}\frac{3}{7n\ln(n)}$

___2. $\sum_{n=1}^{\infty}ne^{-n^2}$

___3. $\sum_{n=1}^{\infty} \frac{10}{n^3+n^7}$

___4. $\sum_{n=1}^{\infty} \frac{1+8^n}{1^n}$

___5. $\sum_{n=1}^{\infty} \frac{n^7}{n^3+6}$

7. **(1 pt) pl/setSeries3Convergent/ns8_3_17BB.pg**

Match each of the following with the correct statement.
C stands for Convergent, D stands for Divergent.

___1. $\sum_{n=1}^{\infty} \frac{2+7^n}{9+6^n}$

___2. $\sum_{n=1}^{\infty} \frac{1}{5+\sqrt[3]{n^4}}$

___3. $\sum_{n=1}^{\infty} \frac{7}{n(n+4)}$

___4. $\sum_{n=1}^{\infty} \frac{7}{n^9-49}$

___5. $\sum_{n=1}^{\infty} \frac{\ln(n)}{9n}$

1. **(1 pt) nauLibrary/setCalcII/ur_sr_6_11.pg**
Select the FIRST correct reason why the given series converges.

A. Convergent geometric series
B. Convergent p-series
C. Integral test
D. Comparison with a convergent p-series
E. Converges by limit comparison test
F. Converges by alternating series test

___1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{5n+2}$
___2. $\sum_{n=2}^{\infty} \frac{n^2+\sqrt{n}}{n^4-8}$
___3. $\sum_{n=1}^{\infty} \left(\frac{-e}{\pi}\right)^n$
___4. $\sum_{n=1}^{\infty} \frac{\sin^2(6n)}{n^2}$
___5. $\sum_{n=2}^{\infty} \frac{3}{n(\ln(n))^2}$
___6. $\sum_{n=1}^{\infty} \frac{n^2+\ln(n)}{n^2-8^n}$

2. **(1 pt) nauLibrary/setCalcII/ur_sr_6_12.pg**
Select the FIRST correct reason why the given series diverges.

A. Diverges because the terms don't have limit zero
B. Divergent geometric series
C. Divergent p series
D. Integral test
E. Comparison with a divergent p series
F. Diverges by limit comparison test
G. Diverges by alternating series test

___1. $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n}}$
___2. $\sum_{n=1}^{\infty} (n)^{-\frac{1}{7}}$
___3. $\sum_{n=1}^{\infty} \frac{\ln(n)}{n}$
___4. $\sum_{n=1}^{\infty} \frac{3n+4}{(-1)^n}$
___5. $\sum_{n=1}^{\infty} (-1)^n \frac{(2n)!}{(n!)^2}$
___6. $\sum_{n=1}^{\infty} \frac{(n+1)(10^2+1)^n}{10^{2n}}$

3. **(1 pt) pl/setSeries7AbsolutelyConvergent/eva8_3_2BB.pg**
Match each of the following with the correct statement.
A. The series is absolutely convergent.
C. The series converges, but is not absolutely convergent.
D. The series diverges.

___1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{7n+3}$
___2. $\sum_{n=1}^{\infty} \frac{\sin(3n)}{n^2}$
___3. $\sum_{n=1}^{\infty} \frac{(n+1)(5^2-1)^n}{5^{2n}}$
___4. $\sum_{n=1}^{\infty} \frac{(-5)^n}{n^5}$
___5. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+4}$

4. **(1 pt) pl/setSeries7AbsolutelyConvergent/eva8_4a.pg**
Match each of the following with the correct statement.
A. The series is absolutely convergent.
C. The series converges, but is not absolutely convergent.
D. The series diverges.

___1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{7^n n!}$
___2. $\sum_{n=1}^{\infty} \frac{(n+2)!}{10^n n!}$
___3. $\sum_{n=1}^{\infty} \frac{n^7}{4^n}$
___4. $\sum_{n=1}^{\infty} \frac{(-1)^n 7^{n-1}}{(7)^{n+1} n^{\frac{1}{4}}}$
___5. $\sum_{n=1}^{\infty} (-1)^n \frac{n!}{3^n}$

5. **(1 pt) pl/setSeries6CompTests/ur_sr_6_18.pg**

For each of the series below select the letter from a to c that best applies and the letter from d to k that best applies. A possible correct answer is af, for example.

A. The series is absolutely convergent.
B. The series converges, but not absolutely.
C. The series diverges.
D. The alternating series test shows the series converges.
E. The series is a p-series.
F. The series is a geometric series.
G. We can decide whether this series converges by comparison with a p series.

H. We can decide whether this series converges by comparison with a geometric series.
I. Partial sums of the series telescope.
J. The terms of the series do not have limit zero.

___1. $\sum_{n=1}^{\infty} \frac{n^9}{9^n}$

___2. $\sum_{n=1}^{\infty} (-1)^n \int_n^{n+1} 2^{-x} dx$

___3. $\sum_{n=5}^{\infty} \frac{(2-1)\cdot((2)2-1)\cdot\cdot((n-1)2-1)}{2^n (n!)\sqrt{n}}$

___4. $\sum_{n=1}^{\infty} (\log(n+1) - \log n)$

___5. $\sum_{n=1}^{\infty} \left(1+\frac{3}{n}\right)^n$

___6. $\sum_{n=1}^{\infty} \frac{n}{n+2^n}$

Here is a short review of numerical series which you may find helpful.
REVIEW OF NUMERICAL SERIES
SEQUENCES
A sequence is a list of real numbers. It is called convergent if it has a limit. An increasing sequence has a limit when it has an upper bound.
SERIES
(Geometric series,rational numbers as decimals, harmonic series,divergence test)
Given numbers forming a sequence $a_1, a_2, ...,$ let us define the nth partial sum as sum of the first n of them $s_n = a_1 + ... + a_n$.
The SERIES is convergent if the SEQUENCE $s_1, s_2, s_3, ...$ is. In other words it converges if the partial sums of the series approach a limit.
A necessary condition for the convergence of this SERIES is that a's have limit 0. If this fails, the series diverges.
The harmonic series 1+(1/2)+(1/3)+... diverges.
This illustrates that the terms a_n having limit zero does not guarantee the convergence of a series.
A series with positive terms ,i.e. $a_n > 0$ for all n, converges exactly when its partial sums have an upper bound.
The geometric series $\sum_{n=1}^{\infty} r^n$ converges exactly when $-1 < r < 1$.

INTEGRAL AND COMPARISON TESTS
(Integral test,p-series, comparison tests for convergence and divergence, limit comparison test)

Integral test: Suppose $f(x)$ is positive and DECREASING for all large enough x. Then the following are equivalent:
I. $\int_1^{\infty} f(x)dx$ is finite, i.e. converges.
S. $\sum_{n=1}^{\infty} f(n)$ is finite, i.e. converges.
This gives the p - test: $\sum_{n=1}^{\infty} \frac{1}{n^p}$ converges exactly when $p > 1$.

Comparison test: Suppose there is a fixed number K such that for all sufficiently large n: $0 < a_n < K b_n$.

Convergence. If $\sum_{n=1}^{\infty} b_n$ converges then so does $\sum_{n=1}^{\infty} a_n$.
Divergence. If $\sum_{n=1}^{\infty} a_n$diverges then so does $\sum_{n=1}^{\infty} b_n$.

(Positive series having smaller terms are more likely to converge.)

Limit comparison test: SUPPOSE: $a_n > 0$, $b_n > 0$ and $\lim_{n\to\infty} \frac{a_n}{b_n} = R$ exists. Moreover, R is not zero.
THEN $\sum_{n=1}^{\infty} a_n$ and $\sum_{n=1}^{\infty} b_n$
both converge or both diverge.

OTHER CONVERGENCE TESTS FOR SERIES
(Alternating series test, absolute convergence, RATIO TEST)
Alternating series test: Suppose the sequence $a_1, a_2, a_3, ...$ is decreasing and has limit zero. Then $\sum_{n=1}^{\infty} (-1)^n a_n$ converges.
This applies to (1)-(1/2)+(1/3)-(1/4)+...

Absolute Convergence Test: IF $\sum_{n=1}^{\infty} |a_n|$ converges,
THEN $\sum_{n=1}^{\infty} a_n$ converges.

Ratio test:
SUPPOSE $|\frac{a_{n+1}}{a_n}|$ has limit equal to r.
IF $r < 1$ then $\sum_{n=1}^{\infty} a_n$ CONVERGES.
IF $r > 1$ the $\sum_{n=1}^{\infty} a_n$ DIVERGES.

WeBWorK assignment number 19_Radius_of_Conv is due : 04/09/2010 at 02:00am MST.

1. **(1 pt) pl/setStewartCh12S2/problem_9.pg**

Find the values of x so that the series below converges.

$$\sum_{n=1}^{\infty} \frac{x^n}{3^n}$$

Give your answer in interval notation.

(________, ________)

2. **(1 pt) pl/setStewartCh12S8/problem_1.pg**

Find the radius of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{x^n}{\sqrt[7]{n}}$$

Your answer should be a nonnegative real number or the phrase "plus_infinity".

Radius of convergence is ________

3. **(1 pt) pl/setStewartCh12S8/problem_2.pg**

Find the radius of convergence of the power series

$$\sum_{n=1}^{\infty} \frac{2^n x^n}{n!}$$

Your answer should be a nonnegative real number or the phrase "plus_infinity".

Radius of convergence is ________

4. **(1 pt) pl/setSeries8Power/eva8_5a_1.pg**

Find the interval of convergence for the given power series.

$$\sum_{n=1}^{\infty} \frac{(x-5)^n}{n(-6)^n}$$

The series is convergent

from $x =$ ___, left end included (enter Y or N): ___

to $x =$ ___, right end included (enter Y or N): ___

5. **(1 pt) pl/setSeries8Power/eva8_5a_2.pg**

Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(10x)^n}{n^7}$$

The series is convergent

from $x =$ ___, left end included (enter Y or N): ___

to $x =$ ___, right end included (enter Y or N): ___

6. **(1 pt) pl/setSeries8Power/eva8_5a_3.pg**

Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(x-6)^n}{6^n}$$

The series is convergent

from $x =$ ___, left end included (enter Y or N): ___

to $x =$ ___, right end included (enter Y or N): ___

7. **(1 pt) pl/setSeries8Power/eva8_5b.pg**

Match each of the power series with its interval of convergence.

___1. $\sum_{n=1}^{\infty} \frac{(x-8)^n}{(8)^n}$

___2. $\sum_{n=1}^{\infty} \frac{(3x)^n}{n^8}$

___3. $\sum_{n=1}^{\infty} \frac{(x-8)^n}{(n!)8^n}$

___4. $\sum_{n=1}^{\infty} \frac{n!(3x-8)^n}{8^n}$

A. $\{8/3\}$
B. $(0,16)$
C. $[\frac{-1}{3}, \frac{1}{3}]$
D. $(-\infty,\infty)$

---

1. **(1 pt) pl/setSeries8Power/eva8_6h.pg**

Represent the function $\frac{5}{(1-7x)}$ as a power series $f(x) = \sum_{n=0}^{\infty} c_n x^n$

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence $R =$ ______ .

---

2. **(1 pt) pl/setSeries8Power/eva8_6c.pg**

The function $f(x) = \frac{4}{1+81x^2}$ is represented as a power series $f(x) = \sum_{n=0}^{\infty} c_n x^n$.

Find the first few coefficients in the power series.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence R of the series.

$R =$ ______ .

---

3. **(1 pt) pl/setSeries8Power/eva8_6a.pg**

Suppose that $\frac{3x}{(4+x)} = \sum_{n=0}^{\infty} c_n x^n$.

Find the first few coefficients.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence R of the power series.

$R =$ ______ .

---

4. **(1 pt) pl/setStewartCh12S9/problem_3.pg**

Consider the function $ln(1+11x)$.

Write a partial sum for the power series which represents this function consisting of the first 5 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6+3^4x^8$. Also indicate the radius of convergence.

Partial Sum: ______

Radius of Convergence: ______

---

5. **(1 pt) pl/setStewartCh12S9/problem_4.pg**

Consider the function $\arctan(x/7)$.

Write a partial sum for the power series which represents this function consisting of the first 5 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6+3^4x^8$. Also indicate the radius of convergence.

Partial Sum: ______

Radius of Convergence: ______

---

6. **(1 pt) pl/setStewartCh12S9/problem_1.pg**

Consider the function

$$\frac{1}{1-x^5}$$

Write a partial sum for the power series which represents this function consisting of the first 5 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6+3^4x^8$. Also indicate the radius of convergence.

Partial Sum: ______

Radius of Convergence: ______

---

7. **(1 pt) pl/setSeries8Power/eva8_6g_a.pg**

The function $f(x) = 8x\ln(1+2x)$ is represented as a power series

$f(x) = \sum_{n=0}^{\infty} c_n x^n$.

Find the FOLLOWING coefficients in the power series.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence R of the series.

$R =$ ______ .

8. **(1 pt) pl/setSeries8Power/eva8_6b_a.pg**

The function $f(x) = \frac{9}{(1+9x)^2}$ is represented as a power series

$f(x) = \sum_{n=0}^{\infty} c_n x^n$.

Find the first few coefficients in the power series.

$c_0 =$ __________

$c_1 =$ __________

$c_2 =$ __________

$c_3 =$ __________

$c_4 =$ __________

Find the radius of convergence R of the series.

$R =$ __________ .

---

1. **(1 pt) pl/setSeries9Taylor/e8_7_7.pg**
Find the Maclaurin series of the function $f(x) = 1x^3 - 3x^2 - 3x + 3$
$(f(x) = \sum_{n=0}^{\infty} c_n x^n)$

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence $R =$ ______ Enter INF if the radius of covergence is infinity .

---

2. **(1 pt) pl/setSeries9Taylor/dp8_7_2.pg**
The Taylor series for $f(x) = x^3$ at -4 is $\sum_{n=0}^{\infty} c_n (x+4)^n$.
Find the first few coefficients.
$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

---

3. **(1 pt) pl/setSeries9Taylor/e8_7_9.pg**
Find Taylor series of function $f(x) = \ln(x)$ at $a = 6$.
$(f(x) = \sum_{n=0}^{\infty} c_n (x-6)^n)$

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the interval of convergence.

The series is convergent:

from $x =$ ___, left end included (Y,N): ___
to $x =$ ___, right end included (Y,N): ___

---

4. **(1 pt) nauLibrary/setCalcII/TaylorSqrtApprox.pg**
The Taylor series for $f(x) = \sqrt{10000+x}$ at $a = 0$ is $\sum_{n=0}^{\infty} c_n (x)^n$.
Find the first few coefficients.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

Find the error in approximating $\sqrt{10497} = f(497)$ using the third degree Taylor polynomial of f at $a = 0$.
That is, find the error of the approximation $\sqrt{10497} \approx T_3(497)$.
The error is ______

---

5. **(1 pt) pl/setSeries9Taylor/ur_sr_9_10.pg**
Find the Maclaurin series of the function $f(x) = (7x^2)\sin(5x)$
$(f(x) = \sum_{n=0}^{\infty} c_n x^n)$

$c_3 =$ ______

$c_4 =$ ______

$c_5 =$ ______

$c_6 =$ ______

$c_7 =$ ______

---

6. **(1 pt) pl/setSeries9Taylor/e8_7_3.pg**
Find $T_4(x)$: the Taylor polynomial of degree 4 of the function $f(x) = \arctan(11x)$ at $a = 0$.

(You need to enter a function.)
$T_4(x) =$ ______

---

7. **(1 pt) pl/setSeries9Taylor/e8_7_4a.pg**
Match each of the Maclaurin series with right function.

___1. $\sum_{n=0}^{\infty} \frac{(-1)^n 2x^{2n+1}}{2n+1}$

___2. $\sum_{n=0}^{\infty} \frac{(-1)^n 2^{2n} x^{2n}}{(2n)!}$

___3. $\sum_{n=0}^{\infty} (-1)^n \frac{2x^{2n+1}}{(2n+1)!}$

___4. $\sum_{n=0}^{\infty} \frac{2^n x^n}{n!}$

A. e^{2x}
B. $\cos(2x)$
C. $2\sin(x)$
D. $2\arctan(x)$

---

8. **(1 pt) pl/setSeries9Taylor/e8_7_6.pg**

Let $F(x) = \int_0^x e^{-2t^4}\, dt$.

Find the MacLaurin polynomial of degree 5 for $F(x)$.

____

Use this polynomial to estimate the value of $\int_0^{0.16} e^{-2x^4}\, dx$.

____

---

9. **(1 pt) pl/setSeries9Taylor/e8_7_15.pg**

Evaluate

$$\lim_{x\to 0} \frac{\cos(x) - 1 + \frac{x^2}{2}}{3x^4}$$

Hint: Using power series.

____

---

10. **(1 pt) pl/setSeries9Taylor/benny_taylor1.pg**

Compute the 6th derivative of

$$f(x) = \arctan\left(\frac{x^2}{6}\right)$$

at $x = 0$.

$f^{(6)}(0) =$ _____________

Hint: Use the MacLaurin series for $f(x)$.

---

1. **(1 pt) pl/setParametric1Curves/ur_pa_1_3.pg**
Eliminate the parameter t to find a Cartesian equation for

$$x = 8 - t$$
$$y = 9 - 2t$$

The Cartesian equation has the form

$$y = mx + b$$

where $m =$ _____ and $b =$ _____.

---

2. **(1 pt) pl/setParametric1Curves/ur_pa_1_2.pg**
Suppose parametric equations for the line segment between $(8, -9)$ and $(7, -7)$ have the form:

$$x = a + bt$$
$$y = c + dt$$

If the parametric curve starts at $(8, -9)$ when $t = 0$ and ends at $(7, -7)$ at $t = 1$, then find a, b, c, and d.
$a =$ _____,

$b =$ _____,

$c =$ _____,

$d =$ _____.

---

3. **(1 pt) pl/setParametric1Curves/ur_pa_1_1.pg**
Assume time t runs from zero to 2π and that the unit circle has been labled as a clock.
Match each of the pairs of parametric equations with the best description of the curve from the following list. Enter the appropriate letter (A, B, C, D, E, F) in each blank.

A. Starts at 12 o'clock and moves clockwise one time around.
B. Starts at 6 o'clock and moves clockwise one time around.
C. Starts at 3 o'clock and moves clockwise one time around.
D. Starts at 9 o'clock and moves counterclockwise one time around.
E. Starts at 3 o'clock and moves counterclockwise two times around.
F. Starts at 3 o'clock and moves counterclockwise to 9 o'clock.

___1. $x = -\sin(t)$; $y = -\cos(t)$
___2. $x = \cos\left(\frac{t}{2}\right)$; $y = \sin\left(\frac{t}{2}\right)$
___3. $x = \cos(t)$; $y = -\sin(t)$
___4. $x = -\cos(t)$; $y = -\sin(t)$
___5. $x = \cos(2t)$; $y = \sin(2t)$

---

4. **(1 pt) pl/setParametric1Curves/ur_pa_1_10.pg**

The ellipse

$$\frac{x^2}{5^2} + \frac{y^2}{8^2} = 1$$

can be drawn counterclockwise with the parametric equations. If

$$x = r\cos(t)$$

then r = _____

and y = _________________________

---

5. **(1 pt) pl/setParametric1Curves/ur_pa_1_11.pg**

A bicycle wheel has radius R. Let P be a point on the spoke of a wheel at a distance d from the center of the wheel. The wheel begins to roll to the right along the the x-axis. The curve traced out by P is given by the following parametric equations:
$x = 14\theta - 13\sin(\theta)$
$y = 14 - 13\cos(\theta)$
What must we have for R and d?
R= _____

d = _____

---

6. **(1 pt) pl/setParametric1Curves/ur_pa_1_12.pg**

Eliminate the parameter t to find a Cartesian equation for:

$$x = t^2$$

$$y = 7 + 3t$$

$$x = Ay^2 + By + C$$

where
A = __________

and B = __________

and C = __________

7. **(1 pt) pl/setParametric1Curves/ur_pa_1_4.pg**

Find the equation for the line tangent to the parametric curve:

$$x = t^3 - 25t$$
$$y = 25t^2 - t^4$$

at the points where $t = 5$ and $t = -5$.
For $t = 5$, the tangent line (in form $y = mx + b$) is
$y =$ ______________________.

For $t = -5$, the tangent line is
$y =$ ______________________.

8. **(1 pt) pl/setParametric1Curves/ur_pa_1_14.pg**

Suppose a curve is traced by the parametric equations

$$x = 1\sin(t)$$

$$y = 26 - 3\cos^2(t) - 6\sin(t)$$

At what point (x,y) on this curve is the tangent line horizontal?
x = _____

y = _____

WeBWorK assignment number 23_3D_Vectors is due : 04/23/2010 at 02:00am MST.

1. **(1 pt) pl/setVectors1space3D/UR_VC_1_1.pg**

What is the distance from the point (3, 10, -1) to the xz-plane?
Distance = ______

2. **(1 pt) pl/setVectors1space3D/UR_VC_1_2.pg**
What do the following equations represent in R^3?
Match the two sets of letters:
a. a vertical plane
b. a horizontal plane
c. a plane which is neither vertical nor horizontal

___ A. $6x + 9y = -2$

___ B. $x = 3$

___ C. $y = 3$

___ D. $z = 4$

3. **(1 pt) pl/setVectors1space3D/UR_VC_1_3.pg**

Find an equation of the sphere with center (0, -4, 0) and radius 5.
__________ = 0
Note that you must move everything to the left hand side of the equation and that we desire the coefficients of the quadratic terms to be 1.

4. **(1 pt) pl/setVectors1space3D/UR_VC_1_4.pg**

Find an equation of the sphere that passes through the origin and whose center is (1, 7, 3).
______________ = 0
Note that you must put everything on the left hand side of the equation and that we desire the coefficients of the quadratic terms to be 1.

5. **(1 pt) pl/setVectors1space3D/UR_VC_1_5.pg**

Find the center and radius of the sphere
$x^2 - 18x + y^2 - 12y + z^2 - 14z = -117$
Center: (___, ___, ___)
Radius: ___

6. **(1 pt) pl/setVectors1space3D/UR_VC_1_6.pg**

Find the equation of a sphere if one of its diameters has endpoints: (4, 2, 6) and (12, 10, 14).
__________ = 0
Note that you must move everything to the left hand side of the equation and that we desire the coefficients of the quadratic terms to be 1.

7. **(1 pt) pl/setVectors1space3D/UR_VC_1_7.pg**

Find an equation of the largest sphere with center (2, 7 , 8) that is contained completely in the first octant.
__________ = 0

Note that you must move everything to the left hand side of the equation that we desire the coefficients of the quadratic terms to be 1.

8. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_10.pg**

A horizontal clothesline is tied between 2 poles, 12 meters apart.
When a mass of 5 kilograms is tied to the middle of the clothesline, it sags a distance of 2 meters.
What is the magnitude of the tension on the ends of the clothesline?
Tension = ________ N

9. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_9.pg**

A child walks due east on the deck of a ship at 4 miles per hour.
The ship is moving north at a speed of 20 miles per hour.
Find the speed and direction of the child relative to the surface of the water.
Speed = ____________ mph
The angle of the direction from the north = ____________ (radians)

10. **(1 pt) pl/setStewartCh13S1/problem_2.pg**

Determine whether the three points P = (2, -5, -1), Q = (4, -1, 5), R = (10, 3, 11) are colinear by computing the distances between pairs of points.
Distance from P to Q: __________
Distance from Q to R: __________
Distance from P to R: __________
Are the three points colinear (y/n)? ___

11. **(1 pt) pl/setStewartCh13S2/problem_1.pg**

Let $\mathbf{a} = \langle 2, -3, -4 \rangle$ and $\mathbf{b} = \langle 4, 2, -2 \rangle$.
Compute:
$\mathbf{a} + \mathbf{b}$ = (___,___,___)
$\mathbf{a} - \mathbf{b}$ = (___,___,___)
$2\mathbf{a}$ = (___,___,___)
$3\mathbf{a} + 4\mathbf{b}$ = (___,___,___)
$|\mathbf{a}|$ = ______

12. **(1 pt) pl/setStewartCh13S2/problem_2.pg**

Let $\mathbf{a} = \langle -2, 4, 4 \rangle$.

Find a unit vector parallel to **a** having positive first coordinate.

(_____,_____,_____)

---

1. **(1 pt) pl/setStewartCh13S3/problem_1.pg**

Find $\mathbf{a} \bullet \mathbf{b}$ if
$\mathbf{a} = \langle -2, 1, 4 \rangle$ and $\mathbf{b} = \langle 0, -3, 1 \rangle$ and

____

Is the angle between the vectors "acute", "obtuse" or "right"?

____

---

2. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_11.pg**

Find $\mathbf{a} \cdot \mathbf{b}$ if
$|\mathbf{a}| = 9$,
$|\mathbf{b}| = 3$,
and the angle between $\mathbf{a}$ and $\mathbf{b}$ is $\frac{\pi}{-1}$ radians.
$\mathbf{a} \cdot \mathbf{b} =$ ____________________

---

3. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_12.pg**

If $\mathbf{a}$ = (-7, -9, 10) and $\mathbf{b}$ = (10, -9, 2),
find $\mathbf{a} \cdot \mathbf{b}$ = __________.

---

4. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_13.pg**

What is the angle in radians between the vectors
$\mathbf{a}$ = (-8, -10, 4) and
$\mathbf{b}$ = (-6, 10, 2)?
Angle: ______________________________ (radians)

---

5. **(1 pt) pl/setVectors2DotProduct/UR_VC_1_14.pg**

Find a unit vector in the same direction as $\mathbf{a}$ = (10, 7, 9).
(____________________,
____________________,
____________________)

---

6. **(1 pt) nauLibrary/setCalcII/vector_projections.pg**

Let $\mathbf{a} = \langle 2, -6, -4 \rangle$ and $\mathbf{b} = \langle 9, 7, -9 \rangle$ be vectors. Find the scalars and vectors defined below. Note that these formulas only depend on $\hat{\mathbf{a}} = \frac{\mathbf{a}}{\|\mathbf{a}\|}$, the unit vector in the direction of $\mathbf{a}$.

The component of $\mathbf{b}$ along $\mathbf{a}$:
$\text{comp}_{\mathbf{a}}\mathbf{b} = \hat{\mathbf{a}} \cdot \mathbf{b} =$ __________

The projection of $\mathbf{b}$ onto $\mathbf{a}$: (Note: you can write this without square roots.)
$P_{\mathbf{a}}\mathbf{b} = (\hat{\mathbf{a}} \cdot \mathbf{b})\hat{\mathbf{a}} = \langle$ __________, __________, __________ $\rangle$

The projection of $\mathbf{b}$ orthogonal to $\mathbf{a}$: (This is defined in terms of the previous projection.)
$P_{\mathbf{a}}^{\perp}\mathbf{b} = \mathbf{b} - P_{\mathbf{a}}\mathbf{b} = \langle$ __________, __________, __________ $\rangle$

Hint: The meaning of these projections is seen from examples where $\mathbf{a} = \mathbf{i} = \langle \mathbf{1}, \mathbf{0}, \mathbf{0} \rangle$.
$\text{comp}_{\mathbf{i}}\langle 2, 1, 5 \rangle = 2$,
$P_{\mathbf{i}}\langle 2, 1, 5 \rangle = \langle 2, 0, 0 \rangle$, and
$P_{\mathbf{i}}^{\perp}\langle 2, 1, 5 \rangle = \langle 0, 1, 5 \rangle$

---

7. **(1 pt) pl/setStewartCh13S3/problem_3.pg**

Find a vector orthogonal to both $\langle 2, -3, 0 \rangle$ and to $\langle 0, -3, 4 \rangle$ of the form
$\langle 1,$ _____, _____ $\rangle$

---

8. **(1 pt) pl/setStewartCh13S3/problem_5.pg**

A constant force $\mathbf{F} = -5\mathbf{i} - 4\mathbf{j} - 3\mathbf{k}$ moves an object along a straight line from the point (-5, 1, 2) to the point (4, -3, 2).

Find the work done if the force is measured in newtons and the position is measured in meters.
Work = ______________________________ newton-meters.

---

9. **(1 pt) pl/setStewartCh13S3/problem_6.pg**

Find the angle between the diagonal of a cube of side length 20 and the diagonal of one of its faces. The angle should be measured in radians.

____

WeBWorK assignment number 25_Cross_Product is due : 04/28/2010 at 02:00am MST.

1. **(1 pt) pl/setStewartCh13S4/problem_1.pg**

Find the cross product $\mathbf{a} \times \mathbf{b}$ where $\mathbf{a} = \langle 3, 3, -4 \rangle$ and $\mathbf{b} = \langle -5, -1, -2 \rangle$.

$\mathbf{a} \times \mathbf{b} = \langle$____,____,____$\rangle$

Find the cross product $\mathbf{c} \times \mathbf{d}$ where $\mathbf{c} = -4\mathbf{i} + 4\mathbf{j} + 5\mathbf{k}$ and $\mathbf{d} = -2\mathbf{i} - 4\mathbf{j} - 5\mathbf{k}$.

$\mathbf{c} \times \mathbf{d} =$ ____ $\mathbf{i}+$____$\mathbf{j}+$____$\mathbf{k}$

2. **(1 pt) pl/setStewartCh13S4/problem_3.pg**

Find two unit vectors orthogonal to $\mathbf{a} = \langle 2, 2, -4 \rangle$ and $\mathbf{b} = \langle 4, 0, -3 \rangle$

Enter your answer so that the first vector has a positive first coordinate

First Vector: $\langle$________, ________, ________$\rangle$

Second Vector: $\langle$________, ________, ________$\rangle$

3. **(1 pt) pl/setStewartCh13S4/problem_4.pg**

Find the area of the parallelogram with vertices:

P(0,0,0), Q(-3,-3,-1), R(-3,-5,-2), S(-6,-8,-3).

____

4. **(1 pt) pl/setStewartCh13S4/problem_5.pg**

Find the volume of the parallelopiped with adjacent edges PQ, PR, PS where

P(-1, -4, 5), Q(1, -1, 8), R(-2, -5, 4), S(5, -6, 7).

____

5. **(1 pt) pl/setStewartCh13S4/problem_6.pg**

A wrench 0.9 meters long lies along the positive y-axis, and grips a bolt at the origin. A force is applied in the direction of $\langle 0, 3, -4 \rangle$ at the end of the wrench. Find the magnitude of the force in newtons needed to supply 100 J of torque to the bolt.

____

6. **(1 pt) pl/setVectors3CrossProduct/ur_vc_2_1.pg**

You are looking down at a map. A vector $\mathbf{u}$ with $|\mathbf{u}|$ = 10 points north and a vector $\mathbf{v}$ with $|\mathbf{v}|$ = 3 points northeast. The crossproduct $\mathbf{u} \times \mathbf{v}$ points:

A) south
B) northwest
C) up
D) down

Please enter the letter of the correct answer: __

The magnitude $|\mathbf{u} \times \mathbf{v}|$ = __________

---

1. **(1 pt) pl/setStewartCh13S5/problem_2.pg**

Find the vector and parametric equations for the line through the point P(-3, -5, -2) and parallel to the vector $-1\mathbf{i}-4\mathbf{j}-5\mathbf{k}$.

Vector Form: $\mathbf{r} = \langle$____, ____, -2 $\rangle + t\langle$ ____, ____, -5 $\rangle$

Parametric form (parameter t, and passing through P when t = 0):

$x = x(t) =$____________

$y = y(t) =$____________

$z = z(t) =$____________

---

2. **(1 pt) pl/setVectors4PlanesLines/ur_vc_2_13.pg**

(A) Find the parametric equations for the line through the point P = (0, -5, 4) that is perpendicular to the plane $-4x-2y+2z=1$. Use "t" as your variable, t = 0 should correspond to P, and the velocity vector of the line should be the same as the standard normal vector of the plane.

x = ____

y = ____

z = ____

(B) At what point Q does this line intersect the yz-plane?

Q = (____, ____, ____)

---

3. **(1 pt) pl/setStewartCh13S5/problem_5.pg**

Find the vector and parametric equations for the line through the point P(4, -1, 2) and the point Q(7, -6, -2).

Vector Form: $\mathbf{r} = \langle$____, ____, 2 $\rangle + t\langle$ ____, ____, -4 $\rangle$

Parametric form (parameter t, and passing through P when t = 0):

$x = x(t) =$____________

$y = y(t) =$____________

$z = z(t) =$____________

---

4. **(1 pt) pl/setStewartCh13S5/problem_6.pg**

Find the vector equation for the line of intersection of the planes $3x-y-2z=0$ and $3x+4z=-4$

$\mathbf{r} = \langle$____, ____,0 $\rangle + t\langle$-4, ____, ____ $\rangle$.

---

5. **(1 pt) pl/setStewartCh13S5/problem_10.pg**

Find an equation of a plane through the point (0, 5, -2) which is orthogonal to the line $x = 5-4t,\ y = -1-1t,\ z = -1-4t$ in which the coefficient of x is -4.

________________________ = 0.

---

6. **(1 pt) pl/setStewartCh13S5/problem_13.pg**

Find an equation of a plane containing the three points (2, 5, -4), (7, 1, -1), (7, 2, 1) in which the coefficient of x is -11.

________________________ = 0.

---

7. **(1 pt) pl/setStewartCh13S5/problem_15b.pg**

Find the angle between the plane $-4x-y+3z=0$ and the plane $3x=4$.

$\theta =$ ____________ degrees.

Notes: The angle between two planes is always less than or equal to 90°.

If you use arccos( ) or acos( ) within WeBWorK, it will return a value in radians.

---

8. **(1 pt) pl/setVectors4PlanesLines/ur_vc_2_14.pg**

Consider the two lines

$L_1 : x = -2t, y = 1+2t, z = 3t$ and

$L_2 : x = -5+1s, y = 2+3s, z = 2+4s$

Find the point of intersection of the two lines.

P = (___, ___, ___)

---

9. **(1 pt) pl/setStewartCh13S5/problem_16.pg**

Compare the the planes below to the plane $-2x+5y+1z=1$.

Match the letter corresponding to the words parallel, orthogonal, or "neither" which describes the relation of the two planes.

___1. $-5x-2y+0z=5$

___2. $-2x+6y+1z=3$

___3. $-10x+25y+5z=-3$

A. neither

B. parallel

C. orthogonal

---

10. **(1 pt) nauLibrary/setCalcII/symmetricEqns.pg**

Consider the line with these parametric equations:

$x = -2t-3$

$y = 3t+2$

$z = -5t+9$.

One set of symmetric equations for this line is

$$\frac{x+3}{-2} = \frac{y-y_0}{b} = \frac{z-z_0}{c},$$

where $y_0 =$ ___, $z_0 =$ ___, $b =$ ___, and $c =$ ___.

Another set of symmetric equations for this line is

$$\frac{x}{2} = \frac{y-y_1}{b} = \frac{z-z_1}{c},$$

where $y_1 =$ ____, $z_1 =$ ____, $b =$ ___, and $c =$ ___.