

```
In[50]:= x = rho Sin[phi] Cos[theta];
y = rho Sin[phi] Sin[theta];
z = rho Cos[phi];
T = {x, y, z}
```

```
Out[53]= {rho Cos[theta] Sin[phi], rho Sin[phi] Sin[theta], rho Cos[phi]}
```

```
In[66]:= Jac = D[T, {{rho, phi, theta}}]
MatrixForm[Jac]
Det[Jac]
Simplify[%]
```

```
Out[66]= {{Cos[theta] Sin[phi], rho Cos[phi] Cos[theta], -rho Sin[phi] Sin[theta]},
{Sin[phi] Sin[theta], rho Cos[phi] Sin[theta], rho Cos[theta] Sin[phi]}, {Cos[phi], -rho Sin[phi], 0}}
```

```
Out[67]//MatrixForm=
```

$$\begin{pmatrix} \cos[\theta] \sin[\phi] & \rho \cos[\phi] \cos[\theta] & -\rho \sin[\phi] \sin[\theta] \\ \sin[\phi] \sin[\theta] & \rho \cos[\phi] \sin[\theta] & \rho \cos[\theta] \sin[\phi] \\ \cos[\phi] & -\rho \sin[\phi] & 0 \end{pmatrix}$$

```
Out[68]=
```

$$\rho^2 \cos[\phi]^2 \cos[\theta]^2 \sin[\phi] + \rho^2 \cos[\theta]^2 \sin[\phi]^3 + \rho^2 \cos[\phi]^2 \sin[\phi] \sin[\theta]^2 + \rho^2 \sin[\phi]^3 \sin[\theta]^2$$

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Out[69]=
```

$$\rho^2 \sin[\phi]$$