Rodriguez Solution Check

```
<< VectorAnalysis`
SetCoordinates[Cartesian[x, y, z]]
```

```
Cartesian[x, y, z]
```

```
r = Sqrt[x^2 + y^2 + z^2];
α = Ω r Cos[Ω r] - Sin[Ω r];
β = 3 α + Ω^2 r^2 Sin[Ω r];
```

```
W = Simplify[Expand[
   -C {α Ω y / r^3 - β x z / r^5, -β y z / r^5 - α Ω x / r^3, β (y^2 + x^2) / r^5 - 2 α / r^3}]]
```

$$\left\{\frac{1}{\left(x^2+y^2+z^2\right)^{5/2}} C\left(-\sqrt{x^2+y^2+z^2}\,\Omega\left(-3xz+x^2y\Omega+y\left(y^2+z^2\right)\Omega\right)\mathrm{Cos}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]+\left(x^2y\Omega+y\left(y^2+z^2\right)\Omega+x^3z\Omega^2+xz\left(-3+y^2\Omega^2+z^2\Omega^2\right)\right)\mathrm{Sin}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]\right),\right.$$

$$\frac{1}{\left(x^2+y^2+z^2\right)^{5/2}} C\left(\sqrt{x^2+y^2+z^2}\,\Omega\left(3yz+xy^2\Omega+x\left(x^2+z^2\right)\Omega\right)\mathrm{Cos}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]+\left(-xy^2\Omega-x\left(x^2+z^2\right)\Omega+y^3z\Omega^2+yz\left(-3+x^2\Omega^2+z^2\Omega^2\right)\right)\mathrm{Sin}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]\right),$$

$$\left.-\frac{1}{\left(x^2+y^2+z^2\right)^{5/2}} C\left(\left(x^2+y^2-2z^2\right)\sqrt{x^2+y^2+z^2}\,\Omega\,\mathrm{Cos}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]+\left(2z^2+x^4\Omega^2+y^4\Omega^2+y^2\left(-1+z^2\Omega^2\right)+x^2\left(-1+2y^2\Omega^2+z^2\Omega^2\right)\right)\mathrm{Sin}\left[\sqrt{x^2+y^2+z^2}\,\Omega\right]\right)\right\}$$

```
eqn1 = FullSimplify[Expand[Curl[W] - Ω W]]
```

```
{0, 0, 0}
```

```
Simplify[Div[W]]
```

```
0
```

```
w0 = W /. C → -1;
w1 = w0 /. Ω → 1;
w2 = w1 /. z → 1;
```

```
% // MatrixForm
w3 = Simplify[Norm[w2]];
```

$$\begin{pmatrix} -\frac{-\sqrt{1+x^2+y^2}\left(-3x+x^2y+y\left(1+y^2\right)\right)\mathrm{Cos}\left[\sqrt{1+x^2+y^2}\right]+\left(x^3+x^2y+x\left(-2+y^2\right)+y\left(1+y^2\right)\right)\mathrm{Sin}\left[\sqrt{1+x^2+y^2}\right]}{\left(1+x^2+y^2\right)^{5/2}} \\ -\frac{\sqrt{1+x^2+y^2}\left(x\left(1+x^2\right)+3y+xy^2\right)\mathrm{Cos}\left[\sqrt{1+x^2+y^2}\right]+\left(-x\left(1+x^2\right)+\left(-2+x^2\right)y-xy^2+y^3\right)\mathrm{Sin}\left[\sqrt{1+x^2+y^2}\right]}{\left(1+x^2+y^2\right)^{5/2}} \\ \frac{\left(-2+x^2+y^2\right)\sqrt{1+x^2+y^2}\,\mathrm{Cos}\left[\sqrt{1+x^2+y^2}\right]+\left(2+x^4+2x^2y^2+y^4\right)\mathrm{Sin}\left[\sqrt{1+x^2+y^2}\right]}{\left(1+x^2+y^2\right)^{5/2}} \end{pmatrix}$$

```
x1 = 2;
y1 = x1;
z1 = x1;
xmin = -x1;
xmax = x1;
ymin = -y1;
ymax = y1;
zmin = -z1;
zmax = z1;

v = VectorPlot3D[w2, {x, xmin, xmax}, {y, ymin, ymax}, {z, zmin, zmax}, VectorPoints → 6,
  VectorStyle → "Arrow3D", VectorColorFunction → "Rainbow", VectorScale → Small]
```