

Divergence and Curl- HW Problems

1. Find the divergence of the following vector fields.
 - a. $\vec{V}(x, y, z) = x^2\vec{i} + y^2\vec{j} + 2xz\vec{k}$
 - b. $\vec{V}(x, y, z) = (\cos(xy))\vec{i} - (y\sin(xy))\vec{j}$.

2. Find the curl of the following vector fields.
 - a. $\vec{V}(x, y, z) = x^2\vec{i} + y^2\vec{j} + z^2\vec{k}$
 - b. $\vec{V}(x, y, z) = \langle yz, 3xz, 2xy \rangle$.

3. Find the scalar curl of the vector field $\vec{F}(x, y) = y^2\vec{i} + x^2\vec{j}$.

4. Which of the following vector fields could be gradient fields?
Which could be the curl of some vector field in $\mathbb{R}^3$?
 - a. $\vec{F}(x, y, z) = y\vec{i} + (x + z)\vec{j} + y\vec{k}$
 - b. $\vec{F}(x, y, z) = (x - y)\vec{i} - (\sin(z))\vec{j} + \vec{k}$
 - c. $\vec{F}(x, y, z) = (y\cos(z))\vec{i} + (x\cos(z))\vec{j} - (xy\sin(z))\vec{k}$.

5. Let $\vec{V}(x, y, z) = \langle xz, y^2z, 2xy \rangle$. Verify the $\nabla \cdot (\nabla \times \vec{V}) = 0$.

6. Let $f(x, y, z) = x^2y + y^2z$. Verify that $\nabla \times (\nabla f) = 0$.