

## Vector Fields- HW Problems

1. Show that the vector field  $\vec{V}(x, y) = (\cos(y))\vec{i} - (\sin(x))\vec{j}$  is not a gradient vector field.

2. Find a function  $f(x, y, z)$  such that  $\nabla f(x, y, z) = \vec{V}(x, y, z)$ .

a.  $\vec{V}(x, y, z) = \langle x^2, y^2, z^2 \rangle$

b.  $\vec{V}(x, y, z) = \langle y\cos(z), x\cos(z), -xysin(z) \rangle$

3. Show that the given curve  $\vec{c}(t)$  is a flow line for the given vector field  $\vec{V}(x, y, z)$ .

a.  $\vec{c}(t) = \langle e^t, \cos(t), \sin(t) \rangle$ ;  $\vec{V}(x, y, z) = \langle x, -z, y \rangle$

b.  $\vec{c}(t) = \langle \frac{1}{t^2}, \frac{1}{t}, e^{2t} \rangle$ ;  $\vec{V}(x, y, z) = \langle -2y^3, -x, 2z \rangle$ .