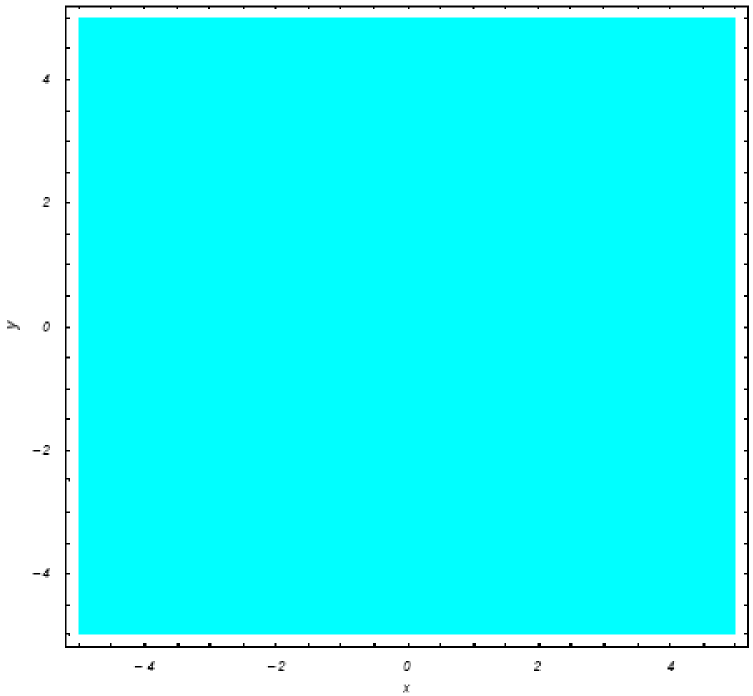
First Home Assignment

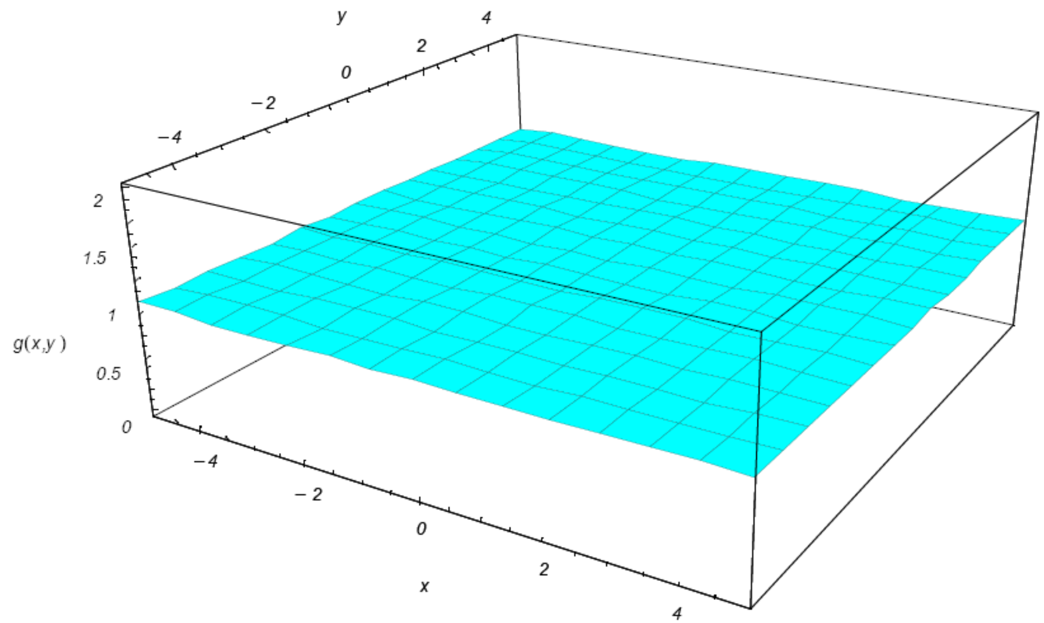
The Divergence of a Vector Field (contd.)

- Yet, the divergence of this vector field produces a scalar field equal to one—**everywhere** (i.e., a **constant** scalar field)!

$$\nabla.\vec{F} = \frac{\partial}{\partial x}x + \frac{\partial}{\partial y}0 = 1$$

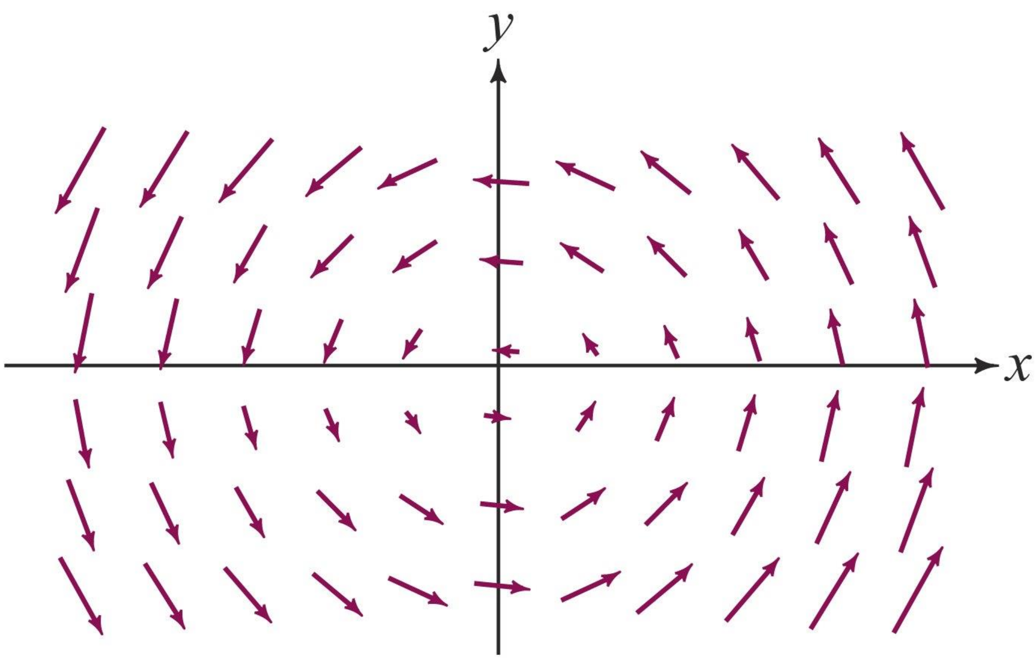
HA #1: Part-1





The Divergence of a Vector Field (contd.)

- Likewise, note the divergence of the following vector fields—it is **zero** at all points (x, y);



$$\vec{F} = -y\hat{a}_x + x\hat{a}_y$$

$$\nabla.\vec{F} = \frac{\partial}{\partial x}(-y) + \frac{\partial}{\partial y}(x) = 0$$

HA #1: Part-2

Although the examples we have examined here were all 2-D, keep in mind that both the original vector field, as well as the scalar field produced by divergence, will typically be **3-D**!

HA #1: Part-3

- Find the divergence of $\vec{F} = 2xz\hat{a}_x - xy\hat{a}_y - z\hat{a}_z$

  Also use MATLAB to demonstrate 2-D and 3-D plots of the vector and the divergence operation.

HA #1: Part-4

- Find the divergence of $\vec{F} = x\hat{a}_x$

  Also use MATLAB to demonstrate 2-D and 3-D plots of the vector and the divergence operation.

HA #1: Part-5

- Find the divergence of $\vec{F} = x\hat{a}_x + y\hat{a}_y$

  Also use MATLAB to demonstrate 2-D and 3-D plots of the vector and the divergence operation.

HA #1: Part-6

- Find the divergence of $\vec{F} = -x\hat{a}_x - y\hat{a}_y$

  Also use MATLAB to demonstrate 2-D and 3-D plots of the vector and the divergence operation.