**Quiz 5** **Calculus 3** **11/16/12**

Each problem is worth 5 points. Clear and complete justification is required for full credit.

1. Let $\mathbf{F}(x,y,z) = \langle yz, x/y, x^2z \rangle$. Find div $\mathbf{F}$.

$\text{div } \vec{F} = \nabla \cdot \vec{F}$

$$\left\langle \frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z} \right\rangle \cdot \left\langle yz, \frac{x}{y}, x^2 z \right\rangle =$$

$$\frac{\partial (yz)}{\partial x} + \frac{\partial (xy^{-1})}{\partial y} + \frac{\partial x^2 z}{\partial z} = 0 + (-xy^{-2}) + x^2$$

Good

$$\boxed{\text{div } \vec{F} = \frac{-x}{y^2} + x^2}$$

2. Let $\mathbf{F}(x,y,z) = \langle yz, x/y, x^2z \rangle$. Find curl $\mathbf{F}$.

$\text{curl } \left\langle yz, \frac{x}{y}, x^2 z \right\rangle$

$$\left\langle \frac{\partial}{\partial x}, \frac{\partial}{\partial y}, \frac{\partial}{\partial z} \right\rangle \times \left\langle yz, \frac{x}{y}, x^2 z \right\rangle = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ \frac{\partial}{\partial x} & \frac{\partial}{\partial y} & \frac{\partial}{\partial z} \\ yz & \frac{x}{y} & x^2 z \end{vmatrix}$$

$$= \left\langle 0 - 0, -(2xz - y), \frac{1}{y} - z \right\rangle$$

Nice work!

$$= \left\langle 0, y - 2xz, \frac{1}{y} - z \right\rangle$$