Math 53 Discussion Problems Nov 26

1. Find the *curl* and *div* of the following vector fields.
   (a) $\mathbf{F}(x, y, z) = \langle 2y, 3x, -z^2 \rangle$
   (b) $\mathbf{F}(x, y, z) = \langle x^2y^3, 1, z \rangle$
   (c) $\mathbf{F}(x, y, z) = \langle x^2, y^2, z^2 \rangle$
   (d) $\mathbf{F}(x, y, z) = \frac{1}{\sqrt{x^2+y^2+z^2}} \langle x, y, z \rangle$
2. Let $\mathbf{F}$ be a differentiable vector field and let $g(x, y, z)$ be a differentiable scalar function. Show that
   (a) $\nabla \cdot (g\mathbf{F}) = g\nabla \cdot \mathbf{F} + \nabla g \cdot \mathbf{F}$
   (b) $\nabla \times (g\mathbf{F}) = g\nabla \times \mathbf{F} + \nabla g \times \mathbf{F}$