# Math 324 Quiz 3 Practice

February 15, 2017

**Problem 1.** Calculate the directional derivative of

$$f(x, y, z) = x^2 y + y^2 z + z^2 x$$

in the direction of $(1, 0, -1)$ at the point $(1, 2, 3)$.

**Problem 2.** Let $f(x, y, z), g(x, y, z)$ be functions. Show that taking the gradient distributes over addition, ie.

$$\nabla(f + g) = \nabla f + \nabla g.$$

**Problem 3.** Calculate the gradient of

$$f(x, y) = \tan^{-1}(y/x).$$

**Problem 4.** Show that

$$\vec{F}(x, y) = \langle -y/(x^2 + y^2), x/(x^2 + y^2) \rangle$$

is a conservative vector field.