1. Let $S$ be the surface described by $z = f(x, y)$. Show that the unit normal vector field to $S$ is given by $\pm \mathbf{n}$, where

$$\mathbf{n} := \frac{1}{\sqrt{1 + \|\nabla f\|^2}} \left( \frac{\partial f}{\partial x}, \frac{\partial f}{\partial y}, -1 \right).$$

*Hint:* Note that $S$ may be parametrized by $\Phi(x, y) := (x, y, f(x, y))$, and recall the formula for the unit normal to a parametrized surface: $\mathbf{n} := (\frac{\partial \Phi}{\partial x} \times \frac{\partial \Phi}{\partial y})/\|\frac{\partial \Phi}{\partial x} \times \frac{\partial \Phi}{\partial y}\|$.

2. Compute the unit normal to the Cone $z = \sqrt{x^2 + y^2}$.

*The first problem is worth 6 points and the second is worth 4 points.*