For the problems below, use the function $f(x, y) = \frac{1}{\sqrt{x^2 + y^2}}$.

1. Find the level curves of the function $f(x, y)$. Sketch the level curves.

2. Find the gradient of $f(x, y)$.

3. Show that the gradient is always orthogonal to level curves of the function.
4. Sketch a few gradient vectors on the same sketch as the level curves.

5. Let $x(r, \theta) = r \cos(\theta)$ and $y(r, \theta) = r \sin(\theta)$. Use both substitution and the chain rule to compute the following partial derivatives

$$\frac{\partial f}{\partial r} = \quad \frac{\partial f}{\partial \theta} =$$

6. Write down the equation for the tangent plane to the surface at the point $(4, 5)$. 