Math 241 Group Quiz 1

Names: _____

1. Either find the following limits or show they do not exist:

a. $\lim_{(x,y)\to(0,0)} \dfrac{x^2+y^2}{\ln\left(x^2+y^2\right)}$

b. $\lim_{(x,y)\to(0,0)} \dfrac{x^2\sin(x/y)}{x^2+y^2}$

c. $\lim_{(x,y)\to(0,0)} \dfrac{x\left(x^2+y^2\right)}{y^2+\left(x^2+y^2\right)^2}$

2. If $z(x,y) = x^2y + x$, $x = r\cos\vartheta$, and $y = r\sin\vartheta$, find $\dfrac{\partial^2 z}{\partial r \partial \vartheta}$ using the chain rule.

3. Let $f(x,y) = y^2 e^{x^2-2xy}$. Find the x,y coordinates where $\nabla f = \mathbf{0}$. What does $\nabla f = \mathbf{0}$ mean geometrically?