Each problem is worth 5 points. For full credit indicate clearly how you reached your answer.

1. Find \( \lim_{(x,y) \to (0,0)} \frac{(x+y)^2}{x^2+y^2} \), or show that it does not exist.

\[
\lim_{(0,y)} \frac{(0+y)^2}{0+y^2} = \frac{y^2}{y^2} = 1
\]

\[
\lim_{y \to x} \frac{(x+y)^2}{x^2+y^2} = \left( \frac{2x}{2x} = \frac{4x^2}{2x^2} = 2 \right.
\]

\[1 \neq 2, \text{ so the limit does not exist.} \]

2. If \( f(x,y) = xy^2 - e^x + \cos(xy) \), find \( f_x \) and \( f_y \).

\[
f_x(x,y) = y^2 - e^x + (-\sin(xy))y \quad \text{(Assume all y are constants)}
\]

\[
f_y(x,y) = 2xy - 0 + (\sin(xy))x \quad \text{(Assume all x are constants)}
\]

\( e^x \) is a number in original because \( x \) is constant. Deriv. of constant is 0.

3. State the definition of the derivative of a function \( f(x,y) \) with respect to \( x \).

\[
f_x(x,y) = \lim_{h \to 0} \frac{f(x+h, y) - f(x,y)}{h}
\]