1. Let \( f(x, y) = \sqrt{x^2 + xy} \). Find the partial derivative \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

\[
\frac{\partial f}{\partial x} = \frac{1}{2} \left[ x^2 + xy \right]^{-1/2} \frac{2x}{\sqrt{x^2 + xy}} = \frac{2x + y}{2 \sqrt{x^2 + xy}}
\]

\[
\frac{\partial f}{\partial y} = \frac{2xy}{2 \sqrt{x^2 + xy}}
\]

2. Let \( f(x, y) = \frac{x}{x^2 + y^2} \). Find the partial derivative \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

\[
\frac{\partial f}{\partial x} = \frac{\partial}{\partial x} \left( \frac{x}{(x^2 + y^2)^2} \right) = \frac{2x(x^2 + y^2) - x \cdot 2x}{(x^2 + y^2)^2} = \frac{2x - x^3}{(x^2 + y^2)^2} = \frac{y^2 - x^2}{(x^2 + y^2)^2}
\]

\[
\frac{\partial f}{\partial y} = -\frac{2xy}{(x^2 + y^2)^2}
\]

3. Let \( f(x, y) = \sin(x^2 y + xy) \). Find the partial derivative \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

\[
\frac{\partial f}{\partial x} = (2xy + y) \cos(x^2 y + xy)
\]

\[
\frac{\partial f}{\partial y} = (x^2 + x) \cos(x^2 y + xy)
\]

4. Let \( f(x, y) = e^{x^2 + y^2} \). Find the partial derivative \( \frac{\partial f}{\partial x} \) and \( \frac{\partial f}{\partial y} \).

\[
\frac{\partial f}{\partial x} = 2xe^{x^2 + y^2}
\]

\[
\frac{\partial f}{\partial y} = 2ye^{x^2 + y^2}
\]