Let $f(x,y) = 2xy + y^2$ *partial deriv.

$d \quad \partial$

$$\lim_{h \to 0} \frac{f(x+h,y) - f(x,y)}{h} = \frac{\partial f}{\partial x}$$

$$= \lim_{h \to 0} \frac{\overbrace{2(x+h)y}^{\cancel{2xy} + 2hy} + \cancel{y^2} - (\cancel{2xy} + \cancel{y^2})}{h} = 2y$$

Let $f(x,y) = 2xy + y^2$

$$\lim_{h \to 0} \frac{f(x,y+h) - f(x,y)}{h} = 2x + 2y$$

$$z = xy - \sin(x^2+y) - e^{\sqrt{x}\,y}$$

$$\frac{\partial z}{\partial x} = y - \cos(x^2+y)2x - \frac{y}{2\sqrt{x}}e^{\sqrt{x}\,y}$$

$$\frac{\partial z}{\partial y} = x - \cos(x^2+y) - \sqrt{x}\,e^{\sqrt{x}\,y}$$

$f(x,y) = 2x^2y - e^{xy}$ $\quad \frac{\partial}{\partial x} = -ye^{xy}$ $\quad \frac{\partial}{\partial y}$: $-e^{xy} - xye^{xy}$ $\quad 4x$

$\frac{\partial}{\partial x}\left(\frac{\partial f}{\partial x}\right) = \frac{\partial^2 f}{\partial x^2} = 4y - y^2e^{xy}$

$\frac{\partial^2 f}{\partial y^2} = -x^2e^{xy}$

$\frac{\partial}{\partial y}\left(\frac{\partial f}{\partial x}\right) = \frac{\partial^2 f}{\partial y \partial x} = 4x - xye^{xy}$

$\frac{\partial^2 f}{\partial x \partial y} =$