5. $z = \sqrt[3]{8xy - y^2}$

$z = (8xy - y^2)^{\frac{1}{3}}$

$$\frac{\partial z}{\partial x} = \frac{1}{3}(8xy - y^2)^{\frac{1}{3}-1} \cdot \frac{\partial}{\partial x}(8xy - y^2)$$

$$= \frac{1}{3}(8xy - y^2)^{-\frac{2}{3}} \cdot 8y$$

$$= \frac{8y}{3(8xy - y^2)^{2/3}}$$

$$\frac{\partial z}{\partial y} = \frac{1}{3}(8xy - y^2)^{\frac{1}{3}-1} \cdot \frac{\partial}{\partial y}(8xy - y^2)$$

$$= \frac{1}{3}(8xy - y^2)^{-\frac{2}{3}} \cdot (8x - 2y)$$

$$= \frac{8x - 2y}{3(8xy - y^2)^{2/3}}$$

6. $f(x,y) = \underbrace{e^{x^2 - y}}_{P} \underbrace{\cos(x^2 y)}_{Q}$

$P' = e^{x^2 - y} \cdot 2x \qquad Q' = -\sin(x^2 y) \cdot 2xy$

$P' = 2xe^{x^2 - y} \qquad Q' = -2xy \sin(x^2 y)$

$P'Q + PQ'$

$$f_x(x,y) = 2xe^{x^2 - y} \cos(x^2 y) + e^{x^2 - y}(-2xy \sin(x^2 y))$$

$$= 2xe^{x^2 - y}\left[\cos(x^2 y) - y \sin(x^2 y)\right]$$