

Instructions: Show all work. Use exact answers unless otherwise asked to round.

1. Find all the first partial derivatives of $f(x, y) = e^y \sin(xy)$.

$$f_x = e^y \cos(xy) \cdot y$$

$$f_y = e^y \sin(xy) + e^y \cos(xy) \cdot x$$

2. Find the total differential of $w = e^y \cos x + z^2$. Use the value of $w(0, 0, 2)$ to estimate the value of $w(0.05, -0.1, 2.01)$.

$$w_x = -e^y \sin x$$

$$w_x(0, 0, 2) = 0$$

$$w_y = e^y \cos x$$

$$w_y(0, 0, 2) = 1$$

$$w_z = 2z$$

$$w_z(0, 0, 2) = 4$$

$$w(0, 0, 2) =$$

$$(1)(1) + 2^2 = 5$$

$$\Delta x = .05$$

$$\Delta y = -.01$$

$$\Delta z = .01$$

$$w(0.05, -0.1, 2.01)$$

$$\approx w(0, 0, 2) + \Delta w =$$

$$5 - .06 = \boxed{4.94}$$

$$\begin{aligned} \Delta w &= w_x \Delta x + w_y \Delta y + w_z \Delta z \\ &= 0(.05) + (1)(-.01) + 4(.01) \\ &= -.1 + .04 = \boxed{-.06} \end{aligned}$$