

4:

$$f = x^2 + y^2, \quad y = x^2$$

$$f_x = 2x, \quad f_y = 2y$$

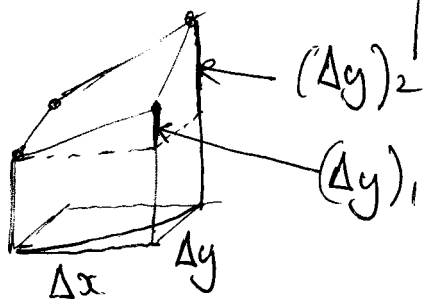
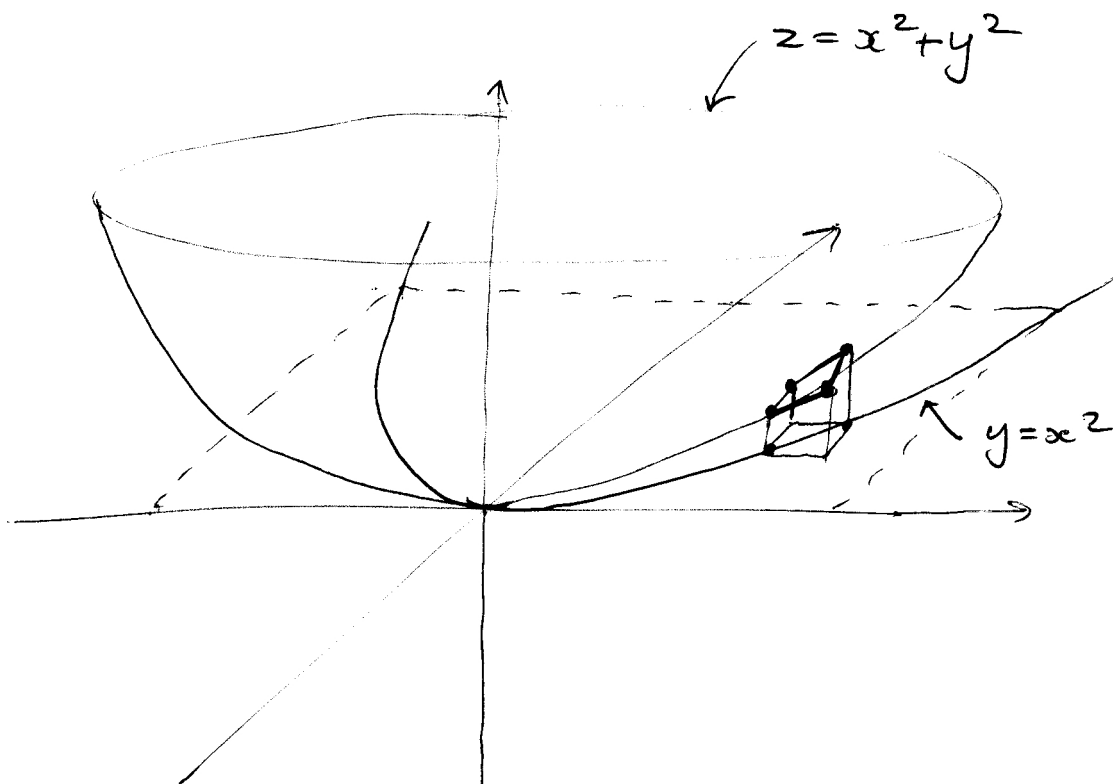
$$\frac{df}{dx} = \left(\frac{\partial f}{\partial x}\right)_y + \left(\frac{\partial f}{\partial y}\right)_x \frac{dy}{dx}$$

$$= 2x + (2y)(2x)$$

$$= 2x + 4x^3$$

Check: $f = x^2 + x^4$

$$\therefore \frac{df}{dx} = 2x + 4x^3.$$



$$\frac{df}{dx} \approx \frac{\Delta y_1}{\Delta x}$$

$$\frac{df}{dx} \approx \frac{\Delta y_2}{\Delta x}$$