

$$1. z = 3x^5 y^2$$

$$dz = f_x(x,y) dx + f_y(x,y) dy$$

$$dz = (3y^2 \cdot 5x^4) dx + (3x^5 \cdot 2y) dy$$
$$= (15x^4 y^2) dx + (6x^5 y) dy$$

$$2. z = y \tan x - x \cos y$$

$$dz = f_x(x,y) dx + f_y(x,y) dy$$

$$dz = (y \sec^2 x - \cos y) dx + (\tan x + x \sin y) dy$$

$$3. z = e^{3x^2 - 2x + 5} \sec y$$

$$dz = e^{3x^2 - 2x + 5} \cdot (6x - 2) \sec y dx + e^{3x^2 - 2x + 5} \sec y \tan y dy$$
$$= e^{3x^2 - 2x + 5} \sec y [(6x - 2) dx + (\tan y) dy]$$

$$4. f(x,y) = x^3 - 7y^2$$

$$f(3,1) = 3^3 - 7(1)^2 = 27 - 7 = 20$$

$$f(3.1, 1.05) = (3.1)^3 - 7(1.05)^2 = 22.0735$$

$$\Delta z = f(3.1, 1.05) - f(3, 1)$$

$$= 22.0735 - 20 = 2.0735$$

$$\Delta z = dz = (3x^2) dx + (-14y) dy$$

$$= (3 \cdot 3^2)(0.1) + (-14 \cdot 1)(.05)$$

$$= 2.7 - .7$$

$$= 2$$