NAME: (print!) _Shaun Goda_   **Section:** _23_

E-MAIL SCANNED .pdf OF COMPLETED QUIZ to DrZcalc3@gmail.com (Attachment: q9FirstLast.pdf) ASAP BUT NO LATER THAN Oct. 5, 8:00pm

1. Find $\frac{\partial f}{\partial r}$ and $\frac{\partial f}{\partial s}$ as **functions of** r **and** s , if

$$f(x,y) = x^2 + 2xy^2 + 2y^3 \quad,$$

and the variables are related by $x = r + 2s$ and $y = 3r + 2s$. You do not need to simplify!

$$\frac{\partial f(x,s)}{\partial x} = 2x + 2s^2$$

$$\frac{\partial f(x,s)}{\partial s} = 4xs + 6s^2$$

$$\frac{\partial x}{\partial r} = 1 \qquad \frac{\partial x}{\partial s} = 2$$

$$\frac{\partial s}{\partial r} = 3 \qquad \frac{\partial s}{\partial s} = 2$$

$$\frac{\partial f(x,s)}{\partial r} = \frac{\partial f(x,s)}{\partial x} \cdot \frac{\partial x}{\partial r} + \frac{\partial f(x,s)}{\partial s} \cdot \frac{\partial s}{\partial r}$$

$$= (2x + 2s^2)(1) + (4xs + 6s^2)(3)$$

$$\frac{\partial f(x,s)}{\partial s} = \frac{\partial f(x,s)}{\partial x} \cdot \frac{\partial x}{\partial s} + \frac{\partial f(x,s)}{\partial s} \cdot \frac{\partial s}{\partial s}$$

$$= (2x + 2s^2)(2) + (4xs + 6s^2)(2)$$

2. Find $\frac{\partial z}{\partial x}$ and $\frac{\partial z}{\partial y}$ if

$$x^2 + y^2 + z^2 = 5xyz + 1 \quad.$$

$$z = \frac{x^2 + s^2 + z^2 - 1}{5xs}$$

$$\frac{\partial z}{\partial x} = \frac{1}{5s}\left(\frac{\partial}{\partial x}\left(\frac{x^2 + s^2 + z^2 - 1}{x}\right)\right)$$

$$= \frac{1}{5s}\left(\frac{(2x)(x) - (x^2 + s^2 + z^2 - 1)(1)}{x^2}\right)$$

$$= \frac{x^2 - s^2 - z^2 + 1}{5x^2 s}$$

$$\frac{\partial z}{\partial s} = \frac{1}{5x}\left(\frac{\partial}{\partial s}\left(\frac{x^2 + s^2 + z^2 - 1}{s}\right)\right)$$

$$= \frac{1}{5x}\left(\frac{(2s)(s) - (x^2 + s^2 + z^2 - 1)(1)}{s^2}\right)$$

$$= \frac{-x^2 + s^2 - z^2 + 1}{5xs^2}$$