"QUIZ" for Lecture 9

NAME: (print!) Prathik Lolla **Section:** _____

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!

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

$\frac{\partial f}{\partial x} = 2x + 2y^2$ $\quad \frac{\partial x}{\partial r} = 1$ $\quad \frac{\partial y}{\partial r} = 3$

$\frac{\partial f}{\partial y} = 4xy + 6y^2$ $\quad \frac{\partial x}{\partial s} = 2$ $\quad \frac{\partial y}{\partial s} = 2$

$\frac{\partial f}{\partial r} = \frac{\partial f}{\partial x}\frac{\partial x}{\partial r} + \frac{\partial f}{\partial y}\frac{\partial y}{\partial r} = (2x+2y^2)(1) + (4xy+6y^2)(3)$

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

$\frac{\partial f}{\partial r} = (2x+2y^2)(1) + (4xy+6y^2)(3)$

$\frac{\partial f}{\partial r} = 2x + 2y^2 + 12xy + 18y^2$

$\frac{\partial f}{\partial r} = 20y^2 + 12xy + 2x$

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

$\frac{\partial f}{\partial s} = 4x + 4y^2 + 8xy + 12y^2$

$\frac{\partial f}{\partial s} = 16y^2 + 8xy + 4x$

$$\boxed{\frac{\partial f}{\partial r} = 20y^2 + 12xy + 2x}$$

$$\boxed{\frac{\partial f}{\partial s} = 16y^2 + 8xy + 4x}$$

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

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

Solving for $\frac{\partial z}{\partial x} \rightarrow \frac{d}{dx}(x^2+y^2+z^2 = 5xyz+1)$

$2x + 2z\frac{\partial z}{\partial x} = 5xy\frac{\partial z}{\partial x}$

$2x = 5xy\frac{\partial z}{\partial x} - 2z\frac{\partial z}{\partial x}$

$2x = \frac{\partial z}{\partial x}(5xy - 2z)$

$$\boxed{\frac{\partial z}{\partial x} = \frac{2x}{5xy - 2z}}$$

Solving for $\frac{\partial z}{\partial y} \rightarrow \frac{d}{dy}(x^2+y^2+z^2 = 5xyz+1)$

$2y + 2z\frac{\partial z}{\partial y} = 5xy\frac{\partial z}{\partial y}$

$2y = 5xy\frac{\partial z}{\partial y} - 2z\frac{\partial z}{\partial y}$

$$\boxed{\frac{\partial z}{\partial y} = \frac{2y}{5xy - 2z}}$$