NAME: (print!) __Krithika Patrachari__   Section: __22__

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!

$\frac{\partial f}{\partial r} = \frac{\partial f}{\partial x}\left(\frac{\partial x}{\partial r}\right) + \frac{\partial f}{\partial y}\left(\frac{\partial y}{\partial r}\right)$

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

$\frac{\partial f}{\partial y} = 4x + 6y^2 \qquad \frac{\partial y}{\partial r} = 3$

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

$= (2x+2y^2) + (12x+18y^2)$

$= \boxed{14x + 20y^2}$

$\frac{\partial f}{\partial s} = \frac{\partial f}{\partial x}\left(\frac{\partial x}{\partial s}\right) + \frac{\partial f}{\partial y}\left(\frac{\partial y}{\partial s}\right)$

$\frac{\partial f}{\partial x} = 2x + 2y^2 \qquad \frac{\partial x}{\partial s} = 2$

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

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

$= 4x + 4y^2 + 8x + 12y^2$

$= \boxed{12x + 16y^2}$

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

$$x^2 + y^2 + z^2 = 5xyz + 1 \quad . \quad x^2 + y^2 + z^2 - 5xyz - 1 = 0$$

$\frac{\partial}{\partial x} = 2x + 2z\frac{\partial z}{\partial x} - 5yz - 5xy\frac{\partial z}{\partial x} - 1 = 0$

$\frac{\partial z}{\partial x}(2z - 5xy) = 5xz - 2x + 1$

$\boxed{\frac{\partial z}{\partial x} = \frac{5xz - 2x + 1}{2z - 5xy}}$

$\frac{\partial}{\partial y} = 2y + 2z\frac{dz}{dy} - 5xz - 5xy\frac{dz}{dy} - 1 = 0$

$\frac{\partial z}{\partial y}(2z - 5xy) = 5xz - 2y + 1$

$\boxed{\frac{\partial z}{\partial y} = \frac{5xz - 2y + 1}{2z - 5xy}}$