

"QUIZ" for Lecture 9

NAME: (print!) SAI EMBAR 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

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

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

$$\begin{aligned} f(r, s) &= (r+2s)^2 + 2(r+2s)(3r+2s)^2 + 2(3r+2s)^3 \\ &= \frac{\partial}{\partial r} (r+2s)^2 + \frac{\partial}{\partial r} 2(r+2s)(3r+2s)^2 + \frac{\partial}{\partial r} 2(3r+2s)^3 \\ &= \boxed{2(r+2s) + 2(2r+6s)(3r+2s)^2 + 12(3r+2s)^2} = \frac{\partial}{\partial r} \\ &= \frac{\partial}{\partial s} (r+2s)^2 + \frac{\partial}{\partial s} 2(r+2s)(3r+2s)^2 + \frac{\partial}{\partial s} 2(3r+2s)^3 \\ &= \boxed{4(r+2s) + 2(2r+6s)^2 + 56rs + 72r^2} + 12(3r+2s)^2 = \frac{\partial}{\partial s} \end{aligned}$$

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

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

$$\frac{\partial}{\partial x} (x^2 + y^2 + z^2) = \frac{\partial}{\partial x} (5xyz + 1)$$

$$2x + 0 + 2z \frac{dz}{dx} = 5y \frac{d}{dx} (xz)$$

$$= (2z - 5xy) \frac{dz}{dx} = 5zy - 2x$$

$$\boxed{\frac{dz}{dx} = \frac{5zy - 2x}{2z - 5xy}}$$

$$\frac{\partial}{\partial y} (x^2 + y^2 + z^2) = \frac{\partial}{\partial y} (5xyz + 1)$$

$$2y + 2z \frac{dz}{dy} = 5x \frac{d}{dy} (yz)$$

$$2y + 2z \frac{dz}{dy} = 5xy \frac{dz}{dy} + 5xz$$

$$\boxed{\frac{dz}{dy} = \frac{5xz - 2y}{2z - 5xy}}$$