

"QUIZ" for Lecture 9

NAME: (print!) Andrew King 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!

$$\frac{df}{dr} = \left(\frac{df}{dx} \cdot \frac{dx}{dr} \right) + \left(\frac{df}{dy} \cdot \frac{dy}{dr} \right)$$

$$\frac{df}{dx} = 2x + 2y^2, \quad \frac{dx}{dr} = 1, \quad \frac{df}{dy} = 4xy + 6y^2, \quad \frac{dy}{dr} = 3$$

$$\frac{df}{dr} = (2x + 2y^2)(1) + (4xy + 6y^2) \cdot 3 = 2x + 2y^2 + 12xy + 18y^2 = \boxed{20y^2 + 12xy + 2x}$$

$$\frac{df}{ds} = \left(\frac{df}{dx} \cdot \frac{dx}{ds} \right) + \left(\frac{df}{dy} \cdot \frac{dy}{ds} \right) \quad \left| \quad \frac{df}{dx} = 2x + 2y^2, \quad \frac{dx}{ds} = 2, \quad \frac{df}{dy} = 4xy + 6y^2, \quad \frac{dy}{ds} = 2 \right.$$

$$\frac{df}{ds} = (2x + 2y^2) \cdot (2) + (4xy + 6y^2) \cdot (2) = 4x + 4y^2 + 8xy + 12y^2 = \boxed{16y^2 + 8xy + 4x}$$

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

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

$$\frac{dz}{dx} : 2x + 2z \frac{dz}{dx} = 5y \frac{dz}{dx}$$

$$\frac{dz}{dy} : 2y + 2z \frac{dz}{dy} = 5x \frac{dz}{dy}$$

$$2x = 5y \frac{dz}{dx} - 2z \frac{dz}{dx}$$

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

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