

"QUIZ" for Lecture 9

NAME: (print!) Afana Rahman 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!

$$\frac{\partial f}{\partial r} = \frac{\partial f}{\partial x} \frac{\partial x}{\partial r} + \frac{\partial f}{\partial y} \frac{\partial y}{\partial r}$$

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

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

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

$$\frac{\partial x}{\partial r} = 1, \frac{\partial y}{\partial r} = 3, \frac{\partial x}{\partial s} = 2, \frac{\partial y}{\partial s} = 2$$

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

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

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

$$x^2 + y^2 + z^2 = 5xyz + 1 \quad (\text{cannot easily solve for } z)$$

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

$$\text{WRT } x: 2x - 5y(z + xz') = 0 \quad \text{WRT } y: 2y - 5x(yz') = 2x - 5x(z + yz')$$

$$0 = 2x - 5yz - 5xyz'$$

$$0 = 2y - 5xz - 5xyz'$$

$$5xyz' = 2x - 5yz$$

$$5xyz' = 2y - 5xz$$

$$\frac{dz}{dx} = \frac{2x - 5yz}{5xy}$$

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