Lecture 9

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Section: 8:40 - 10:00 A.M.

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 variables are related by $x = r + 2s$ and $y = 3r + 2s$

~~$f(r,s) = r^2 + 4sr + 4s^2 + 6r^2 +$~~

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

$$= 2x + 2y^2 + 3(4xy + 6y^2)$$

$$= 2x + 12xy + 20y^2$$

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

$$= 2(2x + 2y^2 + 4xy + 6y^2)$$

$$= 4x + 8xy + 16y^2$$

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

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

$$f(x,y,z) = x^2 + y^2 + z^2 - 5xyz - 1$$

$$\frac{\partial z}{\partial x} = \frac{\partial f}{\partial x} \div \frac{\partial f}{\partial z}$$

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

$$\frac{\partial z}{\partial y} = \frac{\partial f}{\partial y} \div \frac{\partial y}{\partial z}\frac{\partial f}{\partial z}$$

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