

## Quiz 9

1.  $f(x,y) = x^2 + 2xy^2 + 2y^3$   
 $x = r + 2z$        $y = 3r + 2z$

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

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

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

$$\frac{\partial x}{\partial s} = 2 \quad \frac{\partial y}{\partial s} = 2$$

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

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

$$\frac{\partial z}{\partial x} \cdot 2x + 2z \frac{\partial z}{\partial x} = 5yz + 5xy \frac{\partial z}{\partial x}$$

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

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

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

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

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

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