

$$7. \quad w = e^{x^2 y^3 z}, \quad x = 3s + t, \quad y = 2s - 4t, \quad z = 5s$$

$$\frac{\partial w}{\partial s} = \frac{\partial w}{\partial x} \cdot \frac{\partial x}{\partial s} + \frac{\partial w}{\partial y} \cdot \frac{\partial y}{\partial s} + \frac{\partial w}{\partial z} \cdot \frac{\partial z}{\partial s}$$

$$= e^{x^2 y^3 z} (2xy^3z)(3) + e^{x^2 y^3 z} (3x^2 y^2 z)(2) + e^{x^2 y^3 z} (x^2 y^3)(5)$$

$$= e^{x^2 y^3 z} [6xy^3z + 6x^2 y^2 z + 5x^2 y^3]$$

$$= xy^2 e^{x^2 y^3 z} (6yz + 6xz + 5xy)$$

PLUG IN $x = 3s + t, y = 2s - 4t, z = 5s$

$$= (3s+t)(2s-4t)^2 e^{(3s+t)^2 (2s-4t)^3 5s} [6(2s-4t)5s + 6(3s+t)5s + 5(3s+t)(2s-4t)]$$

$$w = e^{x^2 y^3 z}, \quad x = 3s + t, \quad y = 2s - 4t, \quad z = 5s$$

$$\frac{\partial w}{\partial t} = \frac{\partial w}{\partial x} \cdot \frac{\partial x}{\partial t} + \frac{\partial w}{\partial y} \cdot \frac{\partial y}{\partial t} + \frac{\partial w}{\partial z} \cdot \frac{\partial z}{\partial t}$$

$$= e^{x^2 y^3 z} (2xy^3z)(1) + e^{x^2 y^3 z} (3x^2 y^2 z)(-4) + e^{x^2 y^3 z} (x^2 y^3)(0)$$

$$= e^{x^2 y^3 z} [2xy^3z - 12x^2 y^2 z]$$

$$= 2xy^2 z e^{x^2 y^3 z} [y - 6x]$$

$$= 2(3s+t)(2s-4t)^2 5s e^{(3s+t)^2 (2s-4t)^3 5s} [2s-4t - 6(3s+t)]$$