

$$1. w = x^3 - 7y^2 \quad x=t, y=2t$$

$$\frac{dw}{dt} = \frac{\partial w}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial w}{\partial y} \cdot \frac{dy}{dt}$$

$$\frac{dx}{dt} = 1 \quad \frac{dy}{dt} = 2$$

$$= (3x^2)(1) + (-14y)(2)$$

$$= 3x^2 - 28y$$

NOW PLUG IN $x=t$ AND $y=2t$

$$= 3t^2 - 28(2t)$$

$$= \boxed{3t^2 - 56t}$$

$$2. w = x^2 y^2, \quad x=e^t, y=e^{3t}$$

$$a) \frac{dw}{dt} = \frac{\partial w}{\partial x} \cdot \frac{dx}{dt} + \frac{\partial w}{\partial y} \cdot \frac{dy}{dt}$$

$$= (2xy^2)(e^t) + (2x^2y)e^{3t} \cdot 3$$

$$= 2e^t x y^2 + 6e^{3t} x^2 y$$

PLUG IN $x=e^t, y=e^{3t}$

$$= 2e^t e^t (e^{3t})^2 + 6e^{3t} (e^t)^2 e^{3t}$$

$$= 2e^{2t} e^{6t} + 6e^{6t} e^{2t}$$

$$= 2e^{8t} + 6e^{8t}$$

$$= \boxed{8e^{8t}}$$

$$b) w = x^2 y^2$$

PLUG IN $x=e^t, y=e^{3t}$

$$w = (e^t)^2 (e^{3t})^2$$

$$w = e^{2t} e^{6t}$$

$$w = e^{8t}$$

$$\frac{dw}{dt} = e^{8t} \cdot \frac{d}{dt}(8t)$$

$$= \boxed{8e^{8t}}$$