

Let

$$f(t) = 3(2x - 4) + \sin^3(3t) - \cos^3(3t) + t \left(\frac{400 - 2t}{\pi} \right) + (1 - e^t)^{\frac{2}{3}}.$$

We wish to find $f'(t)$ at $t = 0$.

$$\frac{d}{dt} f(t) = \frac{d}{dt} \left(3(2x - 4) + \sin^3(3t) - \cos^3(3t) + t \left(\frac{400 - 2t}{\pi} \right) + (1 - e^t)^{\frac{2}{3}} \right) \quad (1)$$

$$= \frac{d}{dx} 3(2x - 4)^2 + \frac{d}{dt} \left(\sin^3(3t) - \cos^3(3t) + t \left(\frac{400 - 2t}{\pi} \right) + (1 - e^t)^{\frac{2}{3}} \right) \quad (2)$$

$$= (24x - 48) + \frac{d}{dt} \left(\sin^3(3t) - \cos^3(3t) + t \left(\frac{400 - 2t}{\pi} \right) + (1 - e^t)^{\frac{2}{3}} \right) \quad (3)$$

$$= (24x - 48) + \frac{d}{dt} \sin^3(3t) - \frac{d}{dt} \cos^3(3t) + \frac{d}{dt} t \left(\frac{400 - 2t}{\pi} \right) + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (4)$$

$$= (24x - 48) + 9t \cdot \cos^2(3t) - 9t \cdot -\sin^2(3t) + \frac{d}{dt} t \left(\frac{400 - 2t}{\pi} \right) + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (5)$$

$$= (24x - 48) + 9t(\cos^2(3t) + \sin^2(3t)) + \frac{d}{dt} t \left(\frac{400 - 2t}{\pi} \right) + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (6)$$

$$= (24x - 48) + 9t(1) + \frac{d}{dt} t \left(\frac{400 - 2t}{\pi} \right) + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (7)$$

$$= (24x - 48) + 9t + \frac{d}{dt} t \cdot \frac{d}{dt} \left(\frac{400 - 2t}{\pi} \right) + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (8)$$

$$= (24x - 48) + 9t + 1 \cdot \frac{-2}{\pi} + \frac{d}{dt} (1 - e^t)^{\frac{2}{3}} \quad (9)$$

$$= (24x - 48) + 9t - \frac{2}{\pi} + \frac{2}{3}(1 - e^t) \cdot e^t, \quad (10)$$

$$f'(0) = (24x - 48) + 9(0) - \frac{2}{\pi} + \frac{2}{3}(1 - e^{(0)}) \cdot e^{(0)} \quad (11)$$

$$\boxed{= (24x - 48) - \frac{2}{\pi}} \quad (12)$$