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Mechanical Engineering

1) For figure 12-3(1)

$$y = (4t - 3t^2) \text{ m/s}$$

$$\frac{ds}{dt} = v$$

$$\int_{s=0}^s ds = \int_{t=0}^t v dt$$

$$s_1 = \int_0^4 (4t - 3t^2) dt$$
$$= \left[2t^2 - t^3 \right]_0^4$$

$$\text{or } 2(4^2) - (4^3) = (32 - 64) \text{ m} = -32 \text{ m}$$

2) For Figure 12-7

$$a = \left(\frac{0.5t^2 - 8t}{t^2} \right) \text{ m/s}^2$$

$$a = \frac{dv}{dt} = \frac{dv}{dt}$$

$$\frac{dv}{dt} = 3(0.5)t^2 - 8$$

$$= 1.5t^2 - 8$$

$$A = \frac{dv}{dt} = 2$$

$$\frac{dv}{dt}$$

$$= 1.5(2)^2 - 8$$

$$= 6 - 8 = -2 \text{ m/s}^2$$

3) For 12.7

$$a = (4t^2 - 2) \text{ m/s}^2$$

$$a = \frac{dv}{dt} = \frac{dv}{dt}$$

$$s = v \int \frac{14t^2 - 2t + k}{3} dt$$

$$= \frac{t^3}{3} - t^2 + kt + C$$

$$s(t) = \frac{t^3}{3} - t^2 + kt + C$$

$$s(0) = -2 \text{ m}$$

$$s(2) = -25 \text{ m}$$

$$\rightarrow s(0) = C = -2$$

$$\text{or } s(2) = \frac{16}{3} - 6 + 2k = -25$$

$$2k = -11 - \frac{16}{3} = -\frac{58}{3}$$

$$k = -\frac{29}{3}$$

$$s(t) = \left(\frac{t^3}{3} - t^2 - \frac{29t}{3} - 2 \right)$$

$$s(4) = \left(\frac{256}{3} - \frac{48}{3} - \frac{116}{3} - \frac{6}{3} \right) = \frac{86}{3}$$

$$= 28 \frac{2}{3} \text{ m}$$

4) For 12.8

$$a = v \frac{dv}{ds}$$

$$v = v (20 - 0.055s^2) \text{ m/s}$$

$$\frac{dv}{ds} = \frac{d}{ds} (20 - 0.055s^2) = (-0.11s)$$

$$a = v (20 - 0.055s^2) (-0.11s)$$

$$= (0.0055s^2 - 25) \text{ m/s}^2$$

$$a(t) = (0.005(15)^2 - 25)$$

$$= -13.125 \text{ m/s}^2$$