

12.3

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

$$t = 4 \text{ s}$$

$$ds = v dt$$

$$\int_0^s ds = \int_0^4 (4t - 3t^2) dt$$

$$= \frac{4t^2}{2} - \frac{3t^3}{3}$$

$$= 2t^2 - t^3$$

$$\text{At } t = 4$$

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

$$s = \int v dt$$

$$= \int \left( \frac{4}{3} t^2 - 2t^3 + C_1 \right) dt$$

$$s = \frac{1}{3} t^3 - \frac{2t^4}{4} + C_1 t + C_2$$

$$s = \frac{1}{3} t^3 - t^4 + C_1 t + C_2$$

$$\text{① } t = 0 \quad s = -2 \text{ m}$$

$$-2 = \frac{1}{3}(0) - (0) + C_1(0) + C_2$$

$$C_2 = -2$$

$$\text{② } t = 2 \quad s = -20$$

$$-20 = \frac{1}{3}(2)^3 - (2)^4 + C_1(2) - 2$$

$$-20 = \frac{16}{3} - 16 - 2 + 2C_1$$

$$C_1 = -20 + \frac{2}{3}$$

$$C_1 = -9.67 \text{ m/s}$$

$$\text{③ } s \text{ at } t = 4$$

$$s = \frac{1}{3}(4)^3 - 4^4 + 4(-9.67) - 2$$

$$= \frac{256}{3} - 16 - 38.68 - 2 = s = 28.65 \text{ m}$$

12.4

$$v = (0.5t^3 - 8t) \text{ m/s}$$

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

$$a = 0.5 \times 3 t^2 - 8$$

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

$$\text{When } t = 2$$

$$1.5(2)^2 - 8 = -2 \text{ m/s}^2$$

12.7

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

$$v = \int (4t^2 - 2) dt$$

$$= \frac{4}{3} t^3 - \frac{2t}{1} + C_1$$

$$\text{③ } s \text{ at } t = 4$$

$$s = \frac{1}{3}(4)^3 - 4^2 + 4(-9.67) - 2$$

$$= \frac{256}{3} - 16 - 38.68 - 2 = s = 28.65 \text{ m}$$

12-8

$$v = 20 - 0.05s^2$$

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

$$\frac{dv}{ds} = -0.05 \times 2 \times s$$

$$= -0.1s$$

$$\text{at } s = 15$$

$$a = 20 - 0.05(15)^2 \times (-0.1 \times 15)$$

$$8.75 \times -1.5$$

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