

$$4) v = (20 - 0.05s^2) \text{ m/s}$$

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

$$v = 20 - 0.05(15)^2$$

$$= 20 - 0.05(225)$$

$$= 20 - 11.25$$

$$v = 8.75 \text{ m/s}$$

$$\therefore a = \frac{dv}{dt} = \frac{ds}{dt} \cdot \frac{dv}{ds}$$

$$\frac{ds}{dt} = v = 8.75 \text{ m/s}$$

(at 15 m)

$$\frac{dv}{ds} = -0.1$$

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

$$\frac{dv}{ds} = -0.1 (15)$$

$$\frac{dv}{ds} = -1.5 \text{ m}$$

$$a = \frac{dv}{dt} = \frac{ds}{dt} \cdot \frac{dv}{ds} = 1.5 \times 8.75$$

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

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

$$\int v dt = \int ds$$

$$s = \int v dt = 2t^2 - t^3 + C$$

at $t=0, s=0$

$$0 = 2(0)^2 - (0)^3 + C$$

$$C = 0$$

at $t=4\text{s}$

$$s = 2(4)^2 - (4)^3 + 0$$

$$s = 32 - 64$$

$$s = -32 \text{ m}$$

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

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

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

at $t=2\text{s}$

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

$$= 6 - 8$$

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

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

$$\int a dt = \int dv$$

$$v = \int a dt = \frac{4}{3}t^3 - 2t + C_1$$

$$\int v dt = \int ds$$

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

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

at $t=0, s=-2\text{m}$

$$-2 = \frac{1}{3}(0)^4 - (0)^2 + C_1(0) + C_2$$

$$C_2 = -2$$

at $t=2\text{s}, s=-20\text{m}$

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

$$-20 = \frac{16}{3} - 4 + 2C_1 - 2$$

$$-20 = 16 - 12 - 6 + 2C_1$$

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

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

$$2C_1 = \frac{-60 + 2}{3}$$

$$2C_1 = \frac{-58}{3}$$

$$C_1 = \frac{-29}{3}$$

∴ substituting C_1 and C_2 in (3)

at $t=4\text{s}$
 $s = \frac{1}{3}(4)^4 - 4^2 + \left(\frac{-29}{3}\right)(4) + (-2)$

$$s = \frac{256}{3} - 16 - 16 - 2$$

$$= \frac{140}{3} - 18$$

$$= \frac{140 - 54}{3} = \frac{86}{3}$$

$$s = 28.67 \text{ m}$$

4) ✓

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