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Answers

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

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

$\int v \, dt = s$

$\int (4t - 3t^2) \, dt$

$\frac{4t^2}{2} - \frac{3t^3}{3} + C$

$s = 2t^2 - t^3 + C$

At $t=0, s=0$

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

$\therefore C = 0$

$\therefore s = 2t^2 - t^3$

\therefore When $t=4$

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

$s = 32 - 64 = \underline{\underline{-32 \text{ m}}}$

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

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

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

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

When $t=2s$

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

$= 6 - 8$

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

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

When $t=0, s=2\text{m}$ to the left

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

$a = \frac{dv}{dt} \quad \& \quad v = \frac{ds}{dt}$

$\int a \, dt = v$

$\int (4t^2 - 2) \, dt$

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

Then $s = \int v$

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

$\frac{4t^4}{3 \times 4} - \frac{2t^2}{2} + Ct + x$

$s = \frac{t^4}{3} - t^2 + Ct + x$

At when $t=0, s=-2$

$-2 = 0 - 0 + 0 + x$

$x = -2$

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

Also when $t=2s, s=20\text{m}$

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

$\frac{-18}{3} = 5.33 - 4 + 2c$

$\frac{-18 + 13.33}{-2} = 2c - 18 - 1.33 = 2c$

$\frac{-19.67}{2} = 2c$

$c = \underline{\underline{-9.66}}$

$C = \underline{\underline{-9.667}}$

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

$s = ? +$

$s = \frac{(4)^4}{3}$

$s = 85.33$

$s = 28.6$

4. $v = (20 - 0.1t^2)$

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

$a = (20 - 0.1t^2)$

$s = 15\text{m}$

$a = (20 - 0.1t^2)$

$= (20 - 0.1t^2)$

$$\therefore 0 = \frac{t^4}{3} - t^2 - 9.667t - 2.$$

$$s = ? \quad t = 4s.$$

$$s = \frac{(4)^4}{3} - \frac{(4)^2}{1} - 9.667(4) - 2.$$

$$s = 85.33 - 16 - 38.668 - 2.$$

$$s = 28.665 \text{ m} \approx \underline{\underline{28.67 \text{ m}}}.$$

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

$$\frac{dv}{ds} = \cancel{20} - 0.1s$$

$$a = (20 - 0.05s^2) \cancel{(-0.1s)} \quad (0.1)$$

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

$$a = (20 - 0.05(15)^2) \cancel{(-0.1(15))}$$

$$= (20 - 11.25) \quad (-15)$$

$$= 8.75 \quad (-1.5)$$

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