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Chapter 11 problem solving B

Bronze

a) $a = 5 - 2t$

$v = \int a\,dt$

$v = \int 5 - 2t\,dt$

$v = 5t - \frac{2t^2}{2} + C$

$v = 5t - t^2 + C$

$5t - t^2 + C = 6$

when $t = 0$

$5(0) - (0)^2 + C = 6$

$0 + C = 6$

$C = 6$

$v = 5t - t^2 + 6$

when $v = 0$

$0 = 5t - t^2 + 6$

$t = 6 \quad t = -1 \quad t \geqslant 0$

b) $v = 5t - t^2 + 6$

$s = \int v\,dt$

$s = \int 5t - t^2 + 6\,dt$

$s = \frac{5t^2}{2} - \frac{t^3}{3} + 6t$

when $t = 6$

$s = \frac{5(6)^2}{2} - \frac{(6)^3}{3} + 6(6) = 54m$

$s = 54m$

Silver

a) $a = 9 - 6t$

$v = \int a\,dt$

$v = \int 9 - 6t\,dt$

$v = 9t - \frac{6t^2}{2} + C$

$v = 9t - 3t^2 + C$

when $v = 0, c = 0$

$v = 9t - 3t^2$

$9 - 6t = 0$

$9 = 6t$

$t = \frac{9}{6} = 1.5$

when $t = 1.5$

$v = 9(1.5) - 3(1.5)^2$

$v = 6.75 ms^{-1}$

when $t = 3$

$v = 9(3) - 3(3)^2$

~~$v = 0$~~

b) $s = \int v\,dt$

$s = \int 9t - t^2\,dt$

$s = \frac{9t^2}{2} - \frac{3t^3}{3}$

$s = \frac{9t^2}{2} - t^3$

$s = \frac{9(3)^2}{2} - (3)^3$

$s = 13.6m$

$s = \frac{9(1.5)^3}{2} - (1.5)^3$

~~$s = 6.75m$~~

Gold

a) $a = 26 - 12t$

$v = \int a\,dt$

$v = \int 26 - 12t\,dt$

$v = 26t - \frac{12t^2}{2} + c$

$v = 26t - 6t^2 + c$

when $v = 0$, $t = 0$

$0 = 0 + 0 + c$

$c = 0$

$v = 26t - 6t^2$

when $v = 0$

$0 = 26t - 6t^2$

$t = 0 \quad t = \frac{13}{3}$

$s = \int v\,dt = \int 26t - 6t^2 + d$

$s = 13t^2 - 2t^3 + d$

when $t = 0$, $s = 0 \Rightarrow d = 0$

$t = \frac{13}{3} \quad s = 13\left(\frac{13}{3}\right)^2 - 2\left(\frac{13}{3}\right)^3 = \frac{2197}{27}$

$t = 5 \quad s = 13(5)^2 - 2(5)^3 = 75$

Total distance travelled $= \frac{2197}{27} + \left(\frac{2197}{27} - 75\right) = 87.7\text{m}$

b) $13t^2 - 2t^3 = 0$

$t^2(13 - 2t) = 0$

$t = 0 \quad t = 6.5$