F12–3. A particle travels along a straight line with a velocity of $v = (4t - 3t^2)$ m/s, where t is in seconds. Determine the position of the particle when $t = 4$ s. $s = 0$ when $t = 0$.

F12–3

F12–4. A particle travels along a straight line with a speed $v = (0.5t^3 - 8t)$ m/s, where t is in seconds. Determine the acceleration of the particle when $t = 2$ s.

F12–4

F12–7. A particle moves along a straight line such that its acceleration is $a = (4t^2 - 2)$ m/s^2, where t is in seconds. When $t = 0$, the particle is located 2 m to the left of the origin, and when $t = 2$ s, it is 20 m to the left of the origin. Determine the position of the particle when $t = 4$ s.

F12–7

F12–8. A particle travels along a straight line with a velocity of $v = (20 - 0.05s^2)$ m/s, where s is in meters. Determine the acceleration of the particle at $s = 15$ m.

F12–8

F12-3

$s = \int(4t-3t^2) = 2t^2-t^3+c$

when s = 0, t = 0

0=0-0 +c

so that c = 0

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

when t = 4

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

s=-32m **ans**

F12-4

$v = (0.5t^3-8t)$

$dv/dt = 1.5t^2-8$

at $t = 2$

$dv/dt = 1.5(2^2) - 8 = -2 ms^{-2}$ **ans**

F12-7

$a = (4t^2 - 2)$

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

$= \int (4/3)t^3 - 2t + c \, dt$

$= t^4/3 - t^2 + ct + k$

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

therefore,

$0 - 0 + 0 + k = -2$

$k = -2$

when $t = 2$, $s = -20$

$2^4/3 - 2^2 + 2c - 2 = -20$

$16/3 - 4 + 2c - 2 = -20$

$2c = -16/3 + 4 + 2 - 20$

$2c = -58/3$

$c = -29/3$

when $t = 4$

$s = 4^4/3 - 4^2 - 29(4)/3 - 2$

$\equiv 256/3 - 16 - 116/3 - 2$

$= 28.667m$ **ans**

F12-8

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

when $s = 15m$

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

$v = 20 - 0.05(225)$

$= 20 - 11.25$

$= 8.75 ms^{-1}$

$t = ds/dv$

$s = \sqrt{((v-20)/(-0.05))}$

$ds/dv = -10(-20(v-20))^{-0\ 5}$

$d^2s/dv^2 = 200(-20(v-20))^{-1\ 5}$

$a = dv^2/d^2s = ((-20(v-20))^{1\ 5})/200$

when $v = 8.75\ ms^{-1}$

$a = ((-20(8.75-20))^{1\ 5})/200$

$a = 16.875\ ms^{-2}$ **ans**