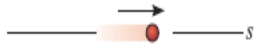


**F12-3.** A particle travels along a straight line with a velocity of  $v = (4t - 3t^2)$  m/s, where  $t$  is in seconds. Determine the position of the particle when  $t = 4$  s.  $s = 0$  when  $t = 0$ .



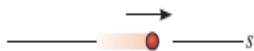
**F12-3**

**F12-7.** A particle moves along a straight line such that its acceleration is  $a = (4t^2 - 2)$  m/s<sup>2</sup>, 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**

**F12-4.** 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**

**F12-8.** 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  $t = 4$

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

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

F12-4

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

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

at  $t = 2$

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

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  $t = 4$

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

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

$$= 28.667 \text{m} \text{ ans}$$

F12-8

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

when  $s = 15 \text{m}$

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

$$v = 20 - 0.05(225)$$

$$= 20 - 11.25$$

$$= 8.75 \text{ms}^{-1}$$

$$t = ds/dv$$

$$s = v((v-20)/(-0.05))$$

$$ds/dv = -10(-20(v-20))^{-0.5}$$

$$d^2s/dv^2 = 200(-20(v-20))^{-1.5}$$

$$a = dv^2/d^2s = ((-20(v-20))^{1.5})/200$$

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

$$a = ((-20(8.75-20))^{1.5})/200$$

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