(1) The speed of a particle moving in one dimension is plotted as a function of time below. Calculate the position and acceleration of the particle at (a) $t = 10$ s (b) $t = 25$ s and (c) $t = 40$ s.

(2) Suppose a particle has velocity given by

$$v(t) = 2k_1 t + 3k_2 t^2 + 4k_3 t^3$$

where $k_1$, $k_2$ and $k_3$ are given constants. Calculate the acceleration of the particle as a function of time.

(3) Suppose a particle has velocity given by

$$v(t) = \frac{\alpha}{\sqrt{t}} + \beta \sqrt{t}$$

where $\alpha$ and $\beta$ are given constants. Calculate the acceleration of the particle as a function of time.

(4) Suppose a particle has acceleration given by

$$a(t) = A + B t$$

where $A$ and $B$ are given constants. Assume the position of the particle at $t = 0$ is $x = x_0$ and that the velocity of the particle at $t = 0$ is $v = v_0$. Calculate the position and velocity of the particle as a function of time.

(5) Suppose a particle has acceleration given by

$$a(t) = A + B \sqrt{t}$$

where $A$ and $B$ are given constants. Assume the position of the particle at $t = 0$ is $x = x_0$ and that the velocity of the particle at $t = 0$ is $v = v_0$. Calculate the position and velocity of the particle as a function of time.