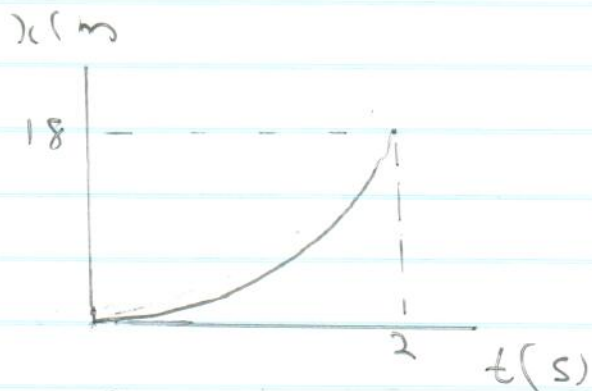
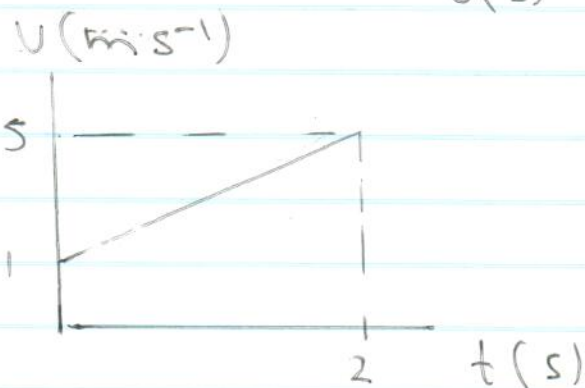


Exercise 9 B

$$1(a) \quad x = 4t^2 + t \quad \text{--- (1)}$$



$$v = \frac{dx}{dt} = 8t + 1 \quad \text{--- (2)}$$



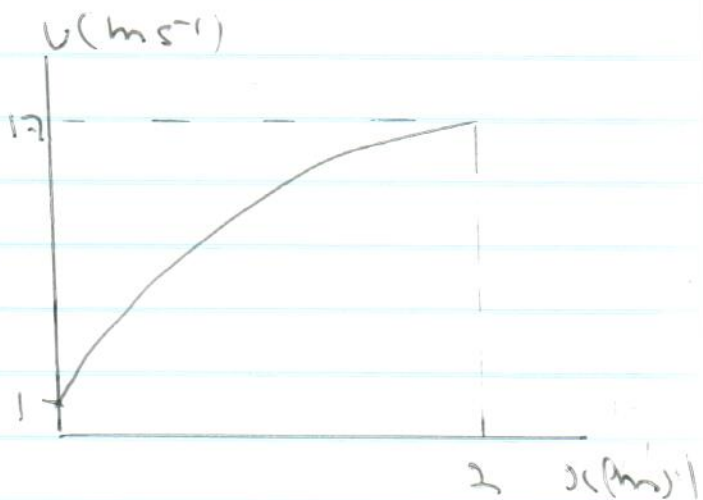
$$\text{From (2): } t = \frac{v-1}{8} \quad \text{--- (3)}$$

$$\text{Sub (3) into (1): } x = \frac{4}{64}(v^2 - 2v + 1) + \frac{1}{8}(v-1)$$

$$x = \frac{1}{16}v^2 - \frac{1}{8}v + \frac{1}{16} + \frac{1}{8}v - \frac{1}{8}$$

$$x = \frac{1}{16}v^2 - \frac{1}{16}$$

$$\therefore v^2 = 16x + 1$$



$$(2) (b) \quad v = e^{1/4 t} \quad \rightarrow (1) \quad t \geq 0$$

$$\therefore a = \frac{dv}{dt} = \frac{1}{4} e^{1/4 t} \quad \rightarrow (2)$$

$$\frac{dx}{dt} = v: \quad \int_0^x dx = \int_0^t e^{1/4 t} dt$$

$$\therefore x = 4 e^{1/4 t} \Big|_0^t = 4(e^{1/4 t} - 1) \quad \rightarrow (3)$$

\therefore Sub (1) into (3):

$$x = 4v - 4$$

$$\therefore v = \frac{1}{4}x + 1$$

(i) From (3): $e^{1/4 t} = \frac{1}{4}x + 1 \quad \rightarrow (4)$

Sub (4) into (2)

$$\therefore a = \frac{1}{4} \left(\frac{1}{4}x + 1 \right)$$

(ii) Sub (1) into (2)

$$a = \frac{1}{4} v$$

$$(9) \quad m = 1800 \text{ kg}$$

$$v_1 = 10 \text{ m s}^{-1}$$

$$v_2 = 30 \text{ m s}^{-1}$$

$$F_D = 4000 \text{ N}$$

$$F_R = 0,9 v^2 \text{ N}$$

$$\Rightarrow \Sigma F_x = m a: \quad 4000 - 0,9 v^2 = 1800 a$$

$$\therefore 1800 \frac{dv}{dx} v = 4000 - 0,9 v^2$$

$$\therefore 1800 \int_{10}^{30} \frac{v}{4000 - 0,9 v^2} dv = \int_0^x dx$$

$$\therefore 1800 \left(-\frac{1}{1,8}\right) \ln(4000 - 0,9 v^2) \Big|_{10}^{30} = x$$

$$\therefore x = -1000 [8,068 - 8,271]$$

$$\therefore x = 204 \text{ m}$$