

Start here for
Question Number: **7**

$$a) \ddot{x} = 4 \cos 2t$$

i) Acceleration \rightarrow Velocity Integrate.

velocity of 1

$$\begin{aligned} &= \int 4 \cos 2t \, dt \\ &= 4 \cdot \frac{1}{2} \sin 2t + C \\ &= 2 \sin 2t + \underline{1} \end{aligned}$$

ii) $t = ?$, comes to a rest, equal to 0

$$2 \sin 2t + 1 = 0$$

$$2 \sin 2t = -1$$

$$\sin 2t = -\frac{1}{2}$$

$$\sin^{-1}\left(-\frac{1}{2}\right)$$

$$\therefore 2t = -30^\circ$$

$$t = 15 \text{ sec/metre}$$

iii) Velocity \rightarrow displacement Integrate.

$$= \int 2 \sin 2t + 1$$

~~$$+ t + C$$~~

$$= 2 \cdot \frac{1}{2} - \cos 2t$$

$$= -\cos 2t + C$$

b)

$$i) y = x^2 \quad (-1, 1)$$

$$M_T = 2x \text{ sub } x = -1 \\ = 2(-1)$$

$$M_T = -2$$

$$y - y_1 = m(x - x_1)$$

$$y - 1 = -2(x + 1)$$

$$y - 1 = -2x - 2$$

$$y = -2x - 1$$

$$2x + y + 1 = 0$$

ii)

$$M \begin{matrix} x_1 & y_1 & x_2 & y_2 \\ (-1, 1) & (2, 4) \end{matrix}$$

$$\frac{4-1}{2-(-1)} = M_{AB} = \frac{3}{3} = 1$$

parallel to AB $\rightarrow -1$

MC is vertical

iii) BT is a tangent to the parabola

$$2x + y + 1 = 0 \text{ meet MC at T}$$

Additional writing space on back page.