Start here for Question Number: 7

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

(i) $\dot{x} = \frac{1}{2}, 4\sin 2t + C$

$= 2\sin 2t + C$

$1 = 2\sin 2(0) + C$

$C = 1$

$\dot{x} = 2\sin 2t + 1$

(ii) $2\sin 2t + 1 = 0$

$2\sin 2t = -1$

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

$2t = \frac{7\pi}{6}, \frac{11\pi}{6}$

$t = \frac{7\pi}{12}$

(iii)

(iii) $x = \frac{1}{2}, -2\cos 2t + C$

$= -\cos 2t + C$

$0 = -\cos 2(0) + C$

$C = 0$

$x = -\cos 2t$

b (i) $y' = 2x$

$= 2(-1)$

$= -2$

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

$y - 1 = -2x - 2$

$2x + y + 1 = 0$

(ii) $M = \frac{2-1}{2}, \frac{4+1}{2}$

$= \frac{1}{2}, \frac{5}{2}$

$m_{AB} = \frac{4-1}{2+1}$

$= \frac{3}{3}$

$= 1$

$2x = 1$

$x = \frac{1}{2}$

sub into y

$y = (\frac{1}{2})^2$

$= \frac{1}{4}$

$C = (\frac{1}{2}, \frac{1}{4})$

$m_{MC} = \frac{\frac{1}{4} - \frac{5}{2}}{\frac{1}{2} - \frac{1}{2}}$

$= \frac{-2\frac{1}{4}}{0} = 0$

$\therefore$ MC is vertical.

Additional writing space on back page.

b) (ii) $m_{MC} = 0$

MC: $x = \frac{1}{2}$

∴ MC is vertical.

(iii) at $x = \frac{1}{2}$

$2x + y + 1 = 0$

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

~~$-2x - 1 = 1$~~

$2x = -y - 1$

$x = \frac{-y}{2} - \frac{1}{2}$

$\frac{-y}{2} - \frac{1}{2} = \frac{1}{2}$

$-y - 1 = 1$

$-y = 2$

$y = -2$

$2x - 2 + 1 = 0$

$2x - 1 = 0$

$x = \frac{1}{2}$

$T = \left(\frac{1}{2}, -2\right)$

$m_{BT} = \frac{4 + 2}{2 - \frac{1}{2}}$

$= \frac{6}{\frac{3}{2}}$

$= 4$

BT: $y + 2 = 4\left(x - \frac{1}{2}\right)$

$y + 2 = 4x - 2$

$4x - y - 4 = 0$

– continued in new booklet

You may ask for an extra Writing Booklet if you need more space to answer question 7.

Start here for Question Number: 7

b) (iii) – continued

$BT = 4x - y - 4 = 0$

$y = 4x - 4$

$4x - 4 = 2x$

$4(2) - 4 = 2(2)$

$8 - 4 = 4$

$4 = 4$

$\therefore$ BT is a tangent to the parabola.