Start here for Question Number: 7

7a) $\dot{x} = \int \ddot{x}$

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

$1 = C$

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

ii) particle comes to rest when $v = 0$

$0 = 2\sin 2t + 1$

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

$2t = -30, 210, 330, 570, 690$

$t = 105, 165, 285, 345$ seconds

particle first comes to rest at 105 seconds

$x = \int \dot{x}\, dx$

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

b) $y' = 2x$

$m = -2$

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

$y - 1 = -2x - 2$

$2x + y + 1 = 0$

ii) ~~grad~~ ~~$x_2 + x_1$~~

M $\frac{x_2 + x_1}{2}$, $\frac{y_2 + y_1}{2}$

M $\left(\frac{1}{2}, \frac{5}{2}\right)$

$\frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{3}{3} = 1$ $m_1 = m_2$ since parallel

$y - \frac{5}{2} = 1\left(x - \frac{1}{2}\right)$

$\frac{2y - 5}{2} = \frac{2x - 1}{2}$

$4y - 10 = 4x - 2$

$4y = 4x + 8$

$y = x + 2$.

iii) $2x + y + 1 = 0$ ①

$y = x + 2$ ②

& sub ② into ①

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

$3x + 3$

$x = -1$

sub back into ② $y = 1$

T $(-1, 1)$

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$$Bt = \frac{y-1}{x+1} = \frac{3}{3}$$

$$y - 1 = x + 1$$

$$y = x + 2$$

$$y' = 2x$$

7b ii) $M = \left(\frac{x_2 + x_1}{2}, \frac{y_2 + y_1}{2}\right)$

$$= \left(\frac{2 + -1}{2}, \frac{4+1}{2}\right)$$

$$M\left(\frac{1}{2}, \frac{5}{2}\right)$$

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

$$= 1$$

$$\frac{y - \frac{5}{2}}{x - \frac{1}{2}} = \frac{y_2 - \frac{5}{2}}{x - \frac{1}{2}} = 1$$

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