1) $x = t + 2$ $\quad y = t^2 + 3$

$x - 2 = t$

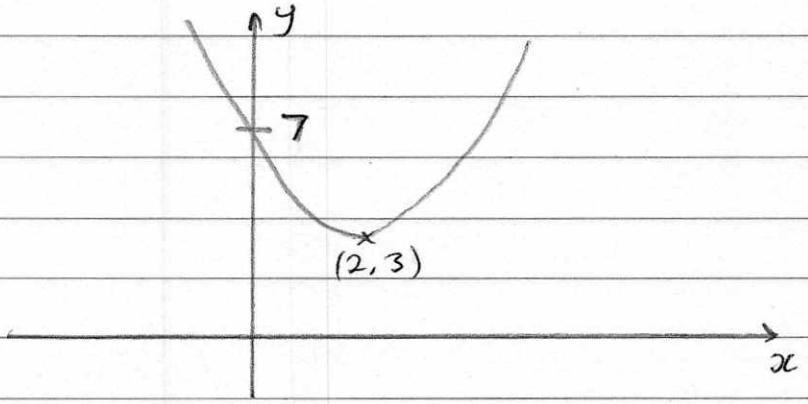
$y = (x - 2)^2 + 3$

b) Crosses y when $x = 0$

$y = (-2)^2 + 3$

$= 7$

min point at $(2, 3)$



2a) Crosses x when $y = 0$

$0 = t^2 - 1$

$1 = t^2$

$t = \pm 1$ $\quad x = 2(1) + 1 = 3$ $\quad x = 2(-1) + 1 = -1$

Crosses ~~x~~ y when ~~y~~ $x = 0$

$0 = 2t + 1$

$-\frac{1}{2} = t$ $\quad y = (-\frac{1}{2})^2 - 1 = -\frac{3}{4}$

$(-1, 0)$ $(3, 0)$ $(0, -3/4)$

b) $\frac{dy}{dt} = 2t$ $\quad \frac{dx}{dt} = 2$

$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{2t}{2} = t$

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

3a/ $x = \tan^2 t$ $\quad y = \cos t$

$\frac{dx}{dt} = 2\tan t \sec^2 t$ $\quad \frac{dy}{dt} = -\sin t$

$$\frac{dy}{dx} = \frac{-\sin t}{2\tan t \sec^2 t}$$

$$= -\tfrac{1}{2} \sin t \cot t \cos^2 t$$

$$= -\tfrac{1}{2} \sin t \frac{\cos t}{\sin t} \cos^2 t$$

$$= -\tfrac{1}{2} \cos^3 t$$

b/ when $t = \frac{\pi}{4}$ $\quad \frac{dy}{dx} = -\frac{1}{2}\left(\cos \frac{\pi}{4}\right)^3$

$$= -\frac{\sqrt{2}}{8}$$

$y = -\frac{\sqrt{2}}{8}x + c$ $\quad$ when $t = \frac{\pi}{4}$ $\quad x = \left(\tan \frac{\pi}{4}\right)^2 = 1$

$\frac{\sqrt{2}}{2} = -\frac{\sqrt{2}}{8} + c$ $\quad y = \cos \frac{\pi}{4} = \frac{\sqrt{2}}{2}$

$c = \frac{5\sqrt{2}}{8}$

$$y = -\frac{\sqrt{2}}{8}x + \frac{5\sqrt{2}}{8}$$

c/ $1 + \tan^2 t = \sec^2 t$

$x = \tan^2 t$ $\quad y = \cos t$

$y^2 = \cos^2 t$

$\frac{1}{y^2} = \sec^2 t$

$$1 + x = \frac{1}{y^2}$$

4a) $x = \sin^2 t$ $\quad y = \sin 2t$

$\frac{dx}{dt} = 2 \sin t \cos t$ $\quad \frac{dy}{dt} = 2\cos 2t$

$$\frac{dy}{dx} = \frac{2\cos 2t}{2 \sin t \cos t}$$

$$= \frac{\cos 2t}{\sin t \cos t}$$

b) $t = \frac{\pi}{6}$ $\quad x = \frac{1}{4}$ $\quad y = \frac{\sqrt{3}}{2}$

$$\frac{dy}{dx} = \frac{\cos\left(\frac{\pi}{3}\right)}{\sin\left(\frac{\pi}{6}\right)\cos\left(\frac{\pi}{6}\right)} = \frac{2\sqrt{3}}{3}$$

$$y = -\frac{3}{2\sqrt{3}}x + c$$

$$y = -\frac{\sqrt{3}}{2}x + c$$

$$\frac{\sqrt{3}}{2} = -\frac{\sqrt{3}}{8} + c$$

$$c = \frac{5\sqrt{3}}{8}$$

$$y = -\frac{\sqrt{3}}{2}x + \frac{5\sqrt{3}}{8}$$

c) $\sin^2 t + \cos^2 t = 1$

$x = \sin^2 t$ $\quad y = \sin 2t$

$y = 2 \sin t \cos t$

$y^2 = 4 \sin^2 t \cos^2 t$

$\frac{y^2}{4\sin^2 t} = \cos^2 t$

$$x + \frac{y^2}{4x} = 1$$

$$4x^2 + y^2 = 4x$$

5a) crosses x when $y=0$

$y = t^2 - 5$

$0 = t^2 - 5$

$5 = t^2$

$t = \pm\sqrt{5}$

$t = \sqrt{5}$

$x = \ln(\sqrt{5} + 1)$

$(\ln\sqrt{5} + 1, 0)$

crosses y when $x=0$

$x = \ln(t+1)$

$0 = \ln(t+1)$

$e^0 = t+1$

$1 = t+1$

$t = 0$

$y = (0)^2 - 5$

$= -5$

$(0, -5)$

b) $\frac{dy}{dt} = 2t$ $\quad \frac{dx}{dt} = \frac{1}{t+1}$

$$\frac{dy}{dx} = 2t \div \frac{1}{t+1}$$

$$= 2t(t+1)$$

$$= 2t^2 + 2t$$

when $t=3$ $\quad y = 4$ $\quad x = \ln 4$

$$\frac{dy}{dx} = 2(3)^2 + 2(3)$$

$$= 24$$

$$y = 24x + c$$

$$4 = 24\ln 4 + c$$

$$4 - 24\ln 4 = c$$

$$y = 24x + 4 - 24\ln 4$$

$$= 24x + 4 - 48\ln 2$$