1) 

$$
\begin{array}{rl}
x=t+2 & y=t^{2}+3 \\
x-2=t & y=(x-2)^{2}+3
\end{array}
$$

b) crosses $y$ when $x=0$

$$
\begin{aligned}
y & =(-2)^{2}+3 \\
& =7
\end{aligned}
$$

min point at $(2,3)$

aa) crosses $x$ when $y=0$

$$
\begin{aligned}
& 0=t^{2}-1 \\
& 1=t^{2} \\
& t= \pm 1
\end{aligned}
$$

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

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

$$
=3
$$

$$
=-1
$$

crosses $\bar{x}$ when $\overline{\bar{x} y}=0$

$$
\begin{array}{rlrl}
0 & =2 t+1 & \\
\frac{-1}{2}=t & y & =\left(-\frac{1}{2}\right)^{2}-1 \\
& =-3 / 4
\end{array}
$$

b)

$$
\begin{aligned}
\frac{d y}{d t}=2 t \quad \frac{d x}{d t} & =2 \\
\frac{d y}{d x}=\frac{\frac{d y}{d t}}{\frac{d x}{d t}}=\frac{2 t}{2} & =t \\
& =\frac{x-1}{2}
\end{aligned}
$$

$3 a /$

$$
\begin{array}{rlr}
x & =\tan ^{2} t & y=\cos t \\
\frac{d x}{d t} & =2 \tan t \sec ^{2} t & \frac{d y}{d t}=-\sin t \\
\frac{d y}{d x} & =\frac{-\sin t}{2 \tan t \sec ^{2} t} & \\
& =-\frac{1}{2} \sin t \cot t \cos ^{2} t \\
& =-\frac{1}{2} \sin t \frac{\cos t}{\sin t} \cos ^{2} t \\
& =-\frac{1}{2} \cos ^{3} t
\end{array}
$$

b) when $t=\frac{\pi}{4} \quad \frac{d y}{d x}=-\frac{1}{2}\left(\cos \frac{\pi}{4}\right)^{3}$

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

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

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

$$
y=\cos \frac{\pi}{4}=\frac{\sqrt{2}}{2}
$$

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

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

c) $1+\tan ^{2} t=\sec ^{2} t$

$$
x=\tan ^{2} t \quad \begin{aligned}
& y=\cos t \\
& y^{2}=\cos ^{2} t \\
& \frac{1}{y^{2}}=\sec ^{2} t
\end{aligned}
$$

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

4a)

$$
\begin{array}{rlr}
x & =\sin ^{2} t & y=\sin 2 t \\
\frac{d x}{d t} & =2 \sin t \cos t & \frac{d y}{d t}=2 \cos 2 t \\
\frac{d y}{d x} & =\frac{2 \cos 2 t}{2 \sin t \cos t} & \\
& =\frac{\cos 2 t}{\sin t \cos t}
\end{array}
$$

b)

$$
\begin{aligned}
& t=\frac{\pi}{6} \quad x=\frac{1}{4} \quad y=\frac{\sqrt{3}}{2} \\
& \frac{d y}{d x}=\frac{\cos \left(\frac{\pi}{3}\right)}{\sin \left(\frac{\pi}{6}\right) \cos \left(\frac{\pi}{6}\right)}=\frac{2 \sqrt{3}}{3} \\
& y=-\frac{3}{2 \sqrt{3}} x+c \\
& y=-\frac{\sqrt{3}}{2} x+c \\
& \frac{\sqrt{3}}{2}=-\frac{\sqrt{3}}{8}+c \\
& c=\frac{5 \sqrt{3}}{8} \\
& y=-\frac{\sqrt{3}}{2} x+\frac{5 \sqrt{3}}{8}
\end{aligned}
$$

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

$$
x=\sin ^{2} t \quad \begin{aligned}
y & =\sin 2 t \\
y & =2 \sin t \cos t \\
y^{2} & =4 \sin ^{2} t \cos ^{2} t \\
\frac{y^{2}}{4 \sin ^{2} t} & =\cos ^{2} t
\end{aligned}
$$

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

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

Sal crosses $x$ when $y=0$ crosses $y$ when $x=0$

$$
\begin{array}{cr}
y=t^{2}-5 & x=\ln (t+1) \\
0=t^{2}-5 & 0=\ln (t+1) \\
5=t^{2} & e^{0}=t+1 \\
t= \pm \sqrt{5} & 1=t+1 \\
t=\sqrt{5} & t=0 \\
x=\ln (\sqrt{5}+1) & y=(0)^{2}-5 \\
& =-5 \\
(\ln \sqrt{5}+1,0) & (0,-5)
\end{array}
$$

b) $\frac{d y}{d t}=2 t$

$$
\frac{d x}{d t}=\frac{1}{t+1}
$$

$$
\begin{aligned}
\frac{d y}{d x} & =2 t \div \frac{1}{t+1} \\
& =2 t(t+1) \\
& =2 t^{2}+2 t
\end{aligned}
$$

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

$$
\begin{aligned}
\frac{d y}{d x} & =2(3)^{2}+2(3) \\
& =24 \\
y & =24 x+c \\
4 & =24 \ln 4+c \\
4-24 \ln 4 & =c \\
y & =24 x+4-24 \ln 4 \\
& =24 x+4-48 \ln 2
\end{aligned}
$$

