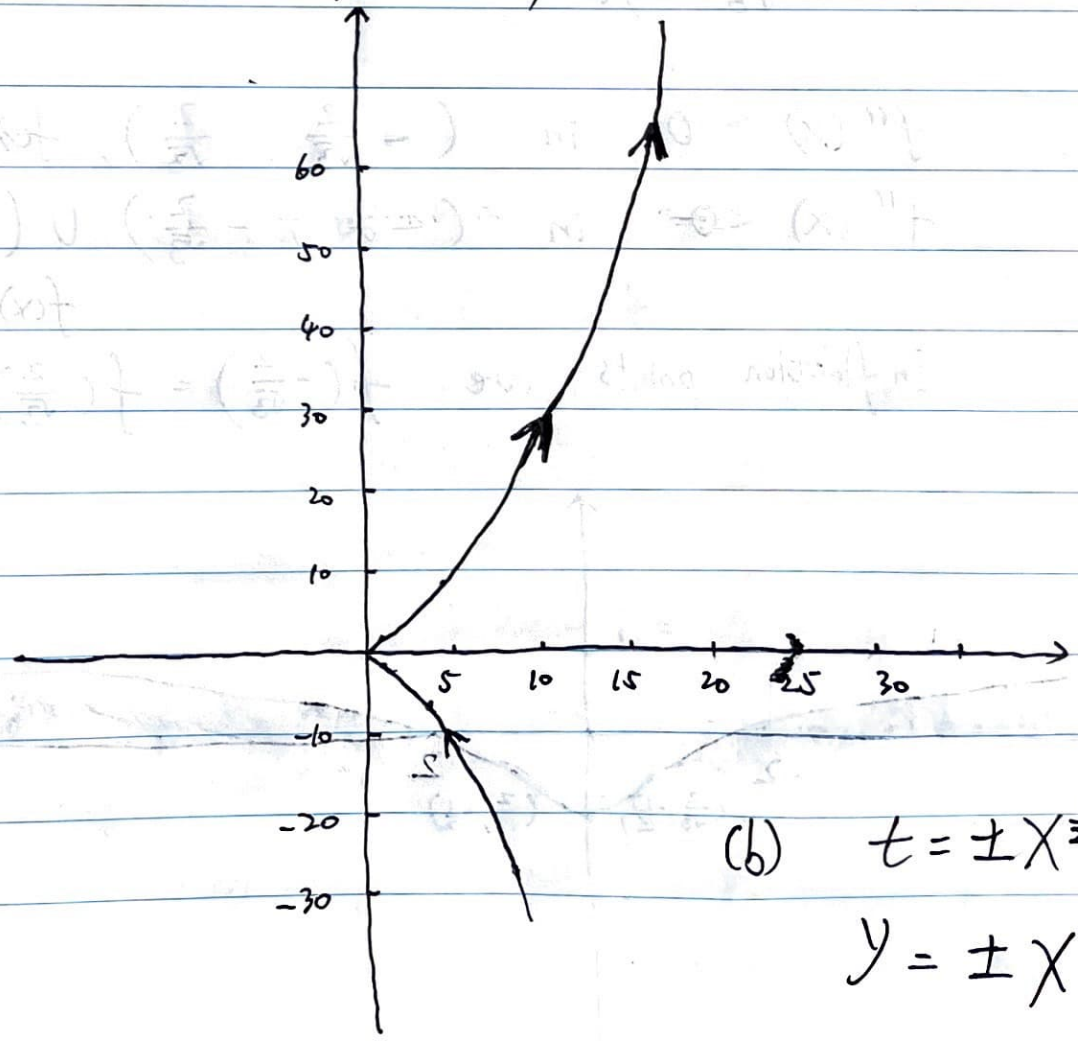
10.4 : 10

(a).

| $t$ | $x(t)$ | $y(t)$ |
|---|---|---|
| 0 | 0 | 0 |
| 1 | 1 | 1 |
| 2 | 4 | 8 |
| 3 | 9 | 27 |
| 4 | 16 | 64 |
| 5 | 25 | 125 |
| -1 | 1 | -1 |
| -2 | 4 | -8 |
| -3 | 9 | -27 |




(b) $t = \pm x^{\frac{1}{2}}$

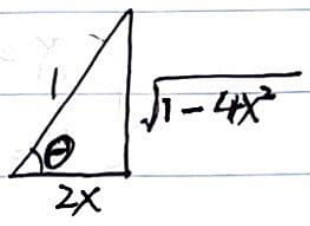
$y = \pm x^{\frac{3}{2}}$

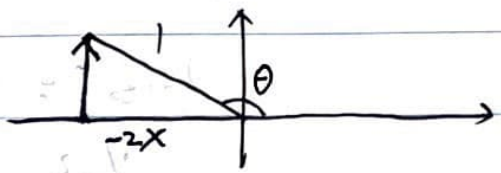
10.1 : 12 (a). $2x = \cos\theta$

$\cos^{-1}(2x) = \theta$

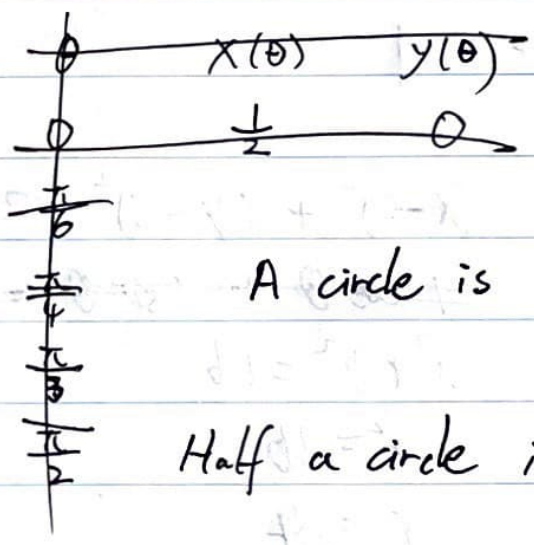
$y = 2\sin\left(\cos^{-1}(2x)\right)$

$= 2\sqrt{1-4x^2}$




(b).



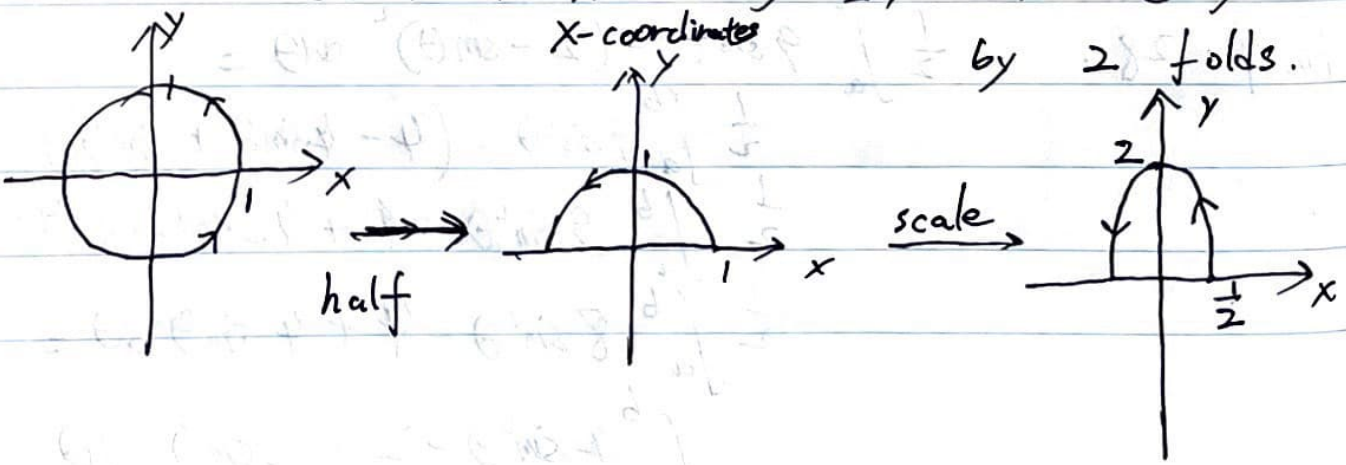

A circle is $x = \cos\theta$, $y = \sin\theta$,

$0 \le \theta \le 2\pi$.

Half a circle is $x = \cos\theta$, $y = \sin\theta$,

$0 \le \theta \le \pi$

Shrink the x-axis by $\frac{1}{2}$, scale the y-coordinates by 2 folds.



10.2 : 30 slope: $\frac{dy/dt}{dx/dt} =$

$$\frac{6t^2}{6t} = t$$

$$\begin{cases} x = 3t^2 + 1 = 4 \\ y = 2t^3 + 1 = 3, \quad t = 1 \end{cases}$$

$$(y-3) = t(x-4), \quad t = 1$$

$$y - 3 = x - 4$$

$$y = x - 1$$

10.3 : 28 (a) $(x-2)^2 + (y-3)^2 = 25$

(b) ~~$4\cos\theta + 4\sin\theta = 1$~~

$$x^2 + y^2 = 16$$

$$r^2 = 16$$

$$r = \pm 4$$

10.4 : 28. $\frac{1}{2}\int_a^b 9\sin^2\theta - (2-\sin\theta)^2 \, d\theta =$

$$\frac{1}{2}\int_a^b 9\sin^2\theta - (4 - 4\sin\theta + \sin^2\theta) \, d\theta =$$

$$\frac{1}{2}\int_a^b 9\sin^2\theta - 4 + 4\sin\theta - \sin^2\theta \, d\theta =$$

$$\frac{1}{2}\int_a^b 8\sin^2\theta - 4 + 4\sin\theta \, d\theta =$$

$$\int_a^b 4\sin^2\theta - 2 + 2\sin\theta \, d\theta$$

let $3\sin\theta = 2 - \sin\theta$

$4\sin\theta = 2$

$\sin\theta = \frac{1}{2}$

$\theta = \frac{\pi}{6}, \frac{5}{6}\pi$

$$\int_{\frac{\pi}{6}}^{\frac{5}{6}\pi} 4\sin^2\theta - 2 + 2\sin\theta \, d\theta$$

$\cos 2\theta = \cos^2\theta - \sin^2\theta$

$= 1 - 2\sin^2\theta$

$\cos 2\theta + 2\sin^2\theta = 1$

$2\sin^2\theta = 1 - \cos 2\theta$

$4\sin^2\theta = 2 - 2\cos 2\theta$

$$\int_{\frac{\pi}{6}}^{\frac{5}{6}\pi} 2 - 2\cos 2\theta - 2 + 2\sin\theta \, d\theta =$$

$$\int_{\frac{\pi}{6}}^{\frac{5}{6}\pi} -2\cos 2\theta + 2\sin\theta \, d\theta =$$

$$(-\sin 2\theta - 2\cos\theta)\Big|_{\frac{\pi}{6}}^{\frac{5}{6}\pi} =$$

$$-\sin\left(\tfrac{5}{3}\pi\right) - 2\cos\left(\tfrac{5}{6}\pi\right) + \sin\left(\tfrac{\pi}{3}\right) + 2\cos\left(\tfrac{\pi}{6}\right)$$

$= 4\cos\left(\frac{\pi}{6}\right) + 2\sin\left(\frac{\pi}{3}\right)$

$= 2\sqrt{3} + \sqrt{3}$

$= 3\sqrt{3}$

~~$= 4\cos\left(\frac{\pi}{6}\right)$~~

~~$= 2\sqrt{3}$~~