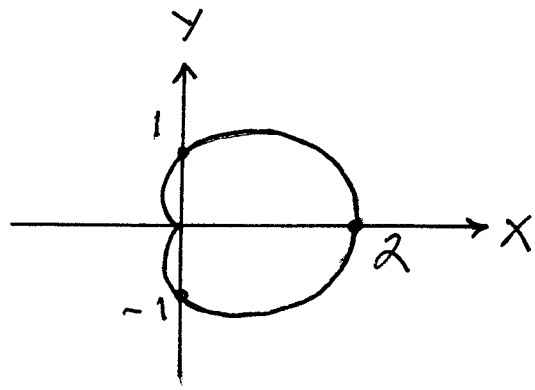
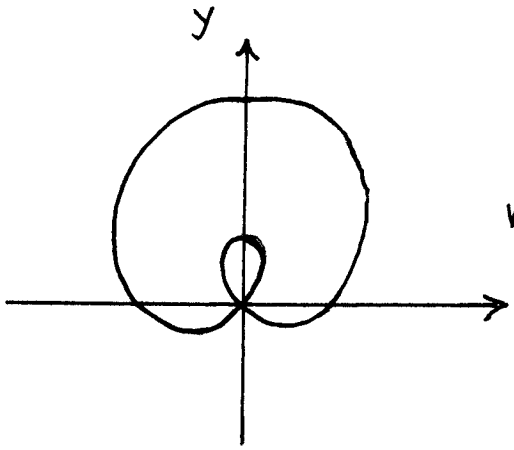
Section 11.4

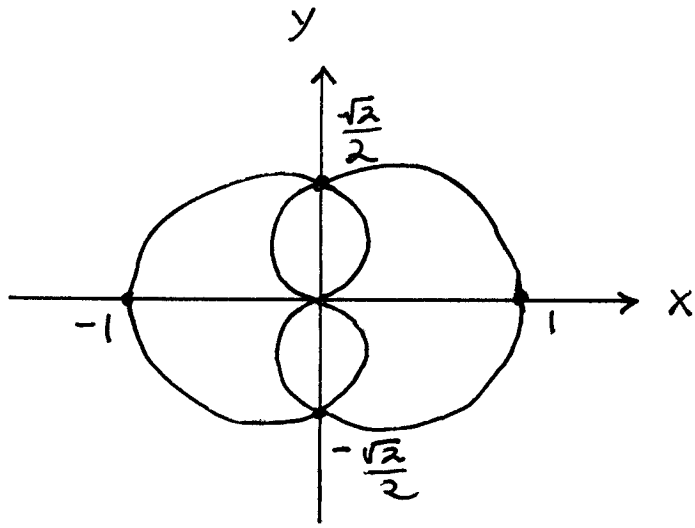
1.) $r = 1 + \cos\theta$



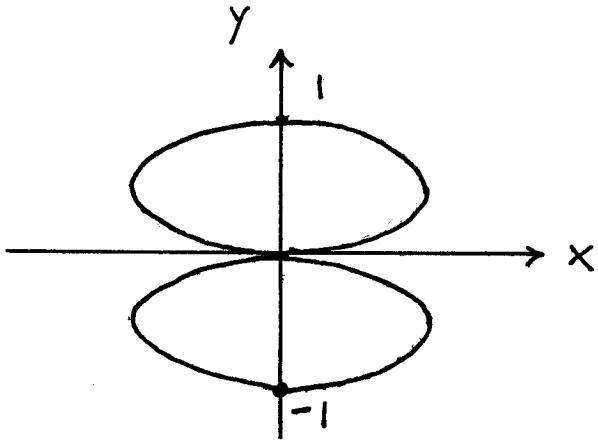
6.) $r = 1 + 2\sin\theta$



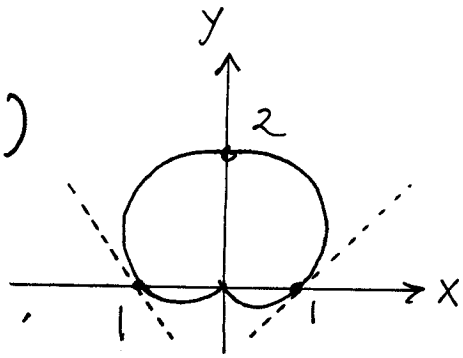
7.) $r = \sin\left(\frac{\theta}{2}\right)$



10.) $r^2 = \sin\theta$



18.) $r = -1 + \sin\theta$



$$\begin{cases} x = r\cos\theta = (-1+\sin\theta)\cos\theta \\ y = r\sin\theta = (-1+\sin\theta)\sin\theta \end{cases}$$

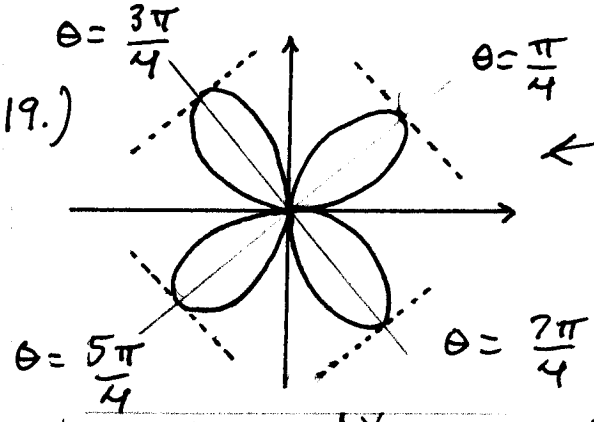
$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta}$$

$$= \frac{(-1+\sin\theta)\cdot\cos 2\theta + \sin\theta\cos 2\theta}{(-1+\sin\theta)(-\sin\theta) + \cos^2 2\theta} ;$$

if $\theta = 0$, then slope $\frac{dy}{dx} = \frac{-1}{1} = -1$,

if $\theta = \pi$, then slope $\frac{dy}{dx} = \frac{(-1)(-1)}{(-1)^2} = 1$.

19.)



$r = \sin 2\theta$

$\begin{cases} x = r\cos\theta = \sin 2\theta\cos\theta \\ y = r\sin\theta = \sin 2\theta\sin\theta \end{cases}$

$$\frac{dy}{dx} = \frac{dy/d\theta}{dx/d\theta} = \frac{\sin 2\theta\cdot\cos\theta + 2\cos 2\theta\cdot\sin\theta}{\sin 2\theta\cdot(-\sin\theta) + 2\cos 2\theta\cdot\cos\theta} ;$$

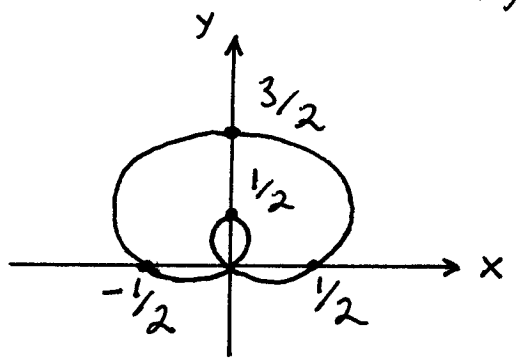
if $\theta = \frac{\pi}{4}$, then $\frac{dy}{dx} = \frac{(1)(\sqrt{2}/2) + 2(0)(\sqrt{2}/2)}{(1)(-\sqrt{2}/2) + 2(0)(\sqrt{2}/2)} = -1$,

if $\theta = -\frac{\pi}{4}$, then $\frac{dy}{dx} = \frac{(-1)(\sqrt{2}/2) + 2(0)(-\sqrt{2}/2)}{(-1)(\sqrt{2}/2) + 2(0)(\sqrt{2}/2)} = 1$,

if $\theta = \frac{3\pi}{4}$, then $\frac{dy}{dx} = \frac{(-1)(-\sqrt{2}/2) + 2(0)(\sqrt{2}/2)}{(-1)(-\sqrt{2}/2) + 2(0)(-\sqrt{2}/2)} = 1$,

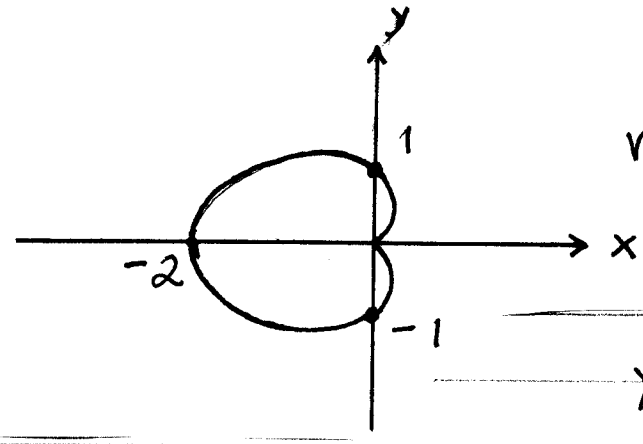
if $\theta = -\frac{3\pi}{4}$, then $\frac{dy}{dx} = \frac{(1)(-\sqrt{2}/2) + 2(0)(-\sqrt{2}/2)}{(1)(\sqrt{2}/2) + 2(0)(-\sqrt{2}/2)} = -1$.

21.)b.)



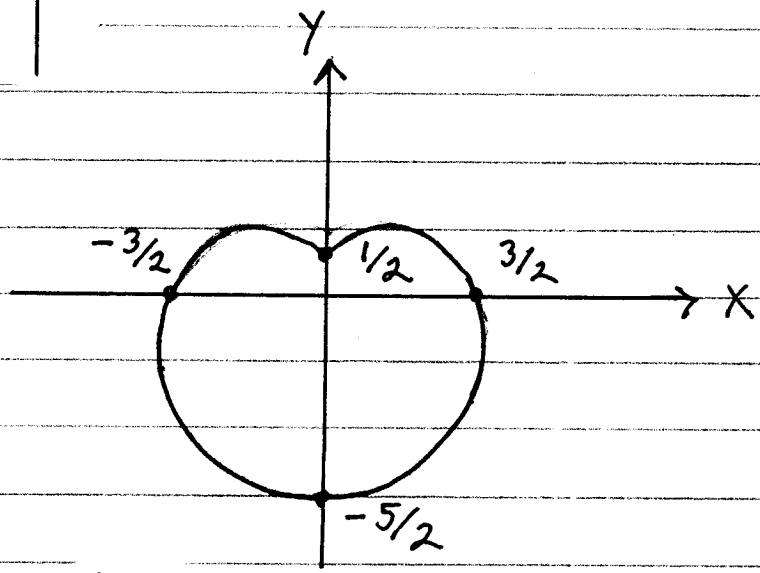
$r = \frac{1}{2} + \sin\theta$

22.) a.)

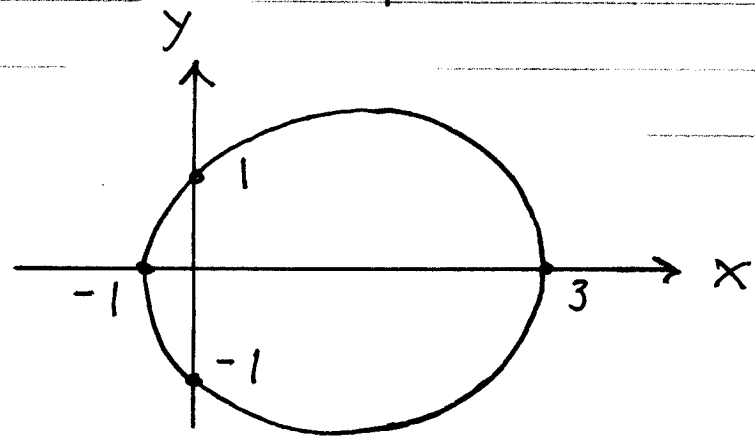


$r = 1 - \cos\theta$

23.) b.) $r = \frac{3}{2} - \sin\theta$



24.) a.) $r = 2 + \cos\theta$

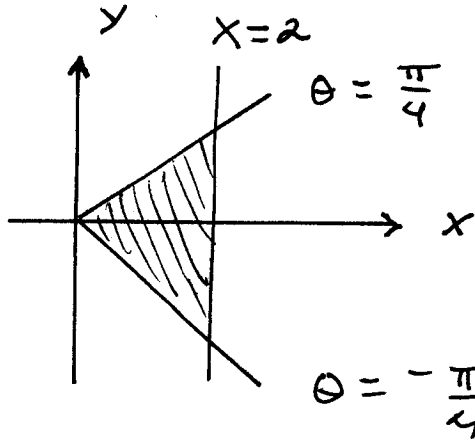


26.) $r = 2\sec\theta = \frac{2}{\cos\theta}$

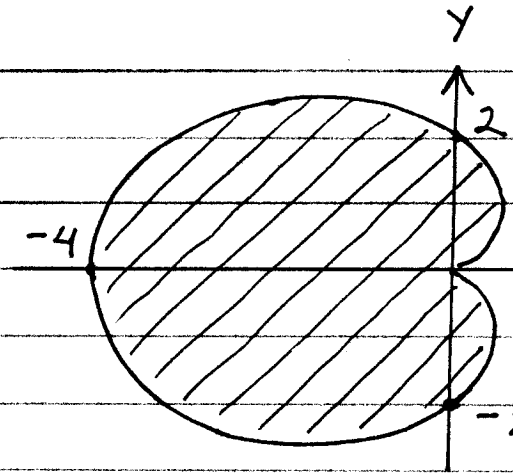
$\rightarrow r\cos\theta = 2$

$\rightarrow x = 2$

$\begin{cases} -\frac{\pi}{4} \le \theta \le \frac{\pi}{4} \\ 0 \le r \le 2\sec\theta \end{cases}$



27.)

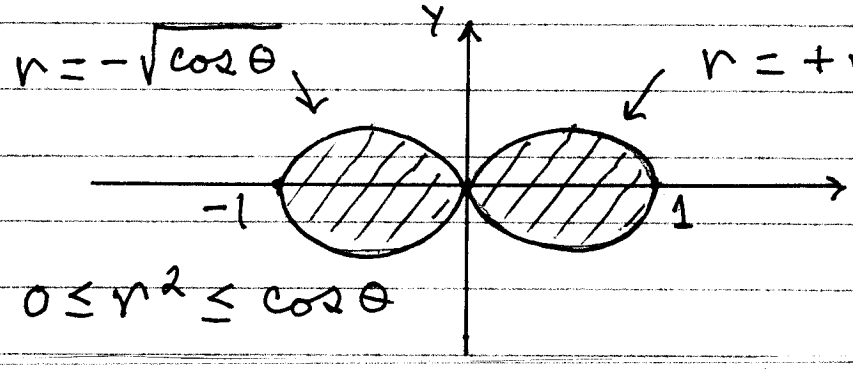


$r = 2 - 2\cos\theta$

$0 \le r \le 2 - 2\cos\theta$

28.) $r^2 = \cos\theta \rightarrow \sqrt{r^2} = \sqrt{\cos\theta} \rightarrow$

$|r| = \sqrt{\cos\theta} \rightarrow r = \pm\sqrt{\cos\theta}$



$r = -\sqrt{\cos\theta}$

$r = +\sqrt{\cos\theta}$

$0 \le r^2 \le \cos\theta$