11.2 I #s 1, 2, 4, 5, 9, 11, 18, 25, 29

11.2 II #s 31, 32, 37, 38, 41, 44, 49, 51, 53, 57, 60 Tues

11.3 I #s 1, 3, 6, 8, 9, 14, 17, 20, 23, 26, 27, 29, 32, 40, 43 T/W

11.3 II #s 51, 55, 57, 60, 63, 66, 69, 71, 73, 77, 78

multiply both sides by r

Replace $r\sin\theta$ by y, etc.

Symmetry Pg 680

$r = f(\theta)$ is even func. $\Rightarrow$ symmetric about polar axis.

x-axis

unchanged when r is replaced by $-r$.

Symmetric about pole

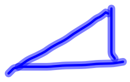
unchanged when θ replaced by $\pi - \theta$

symmetric about line $\theta = \frac{\pi}{2}$

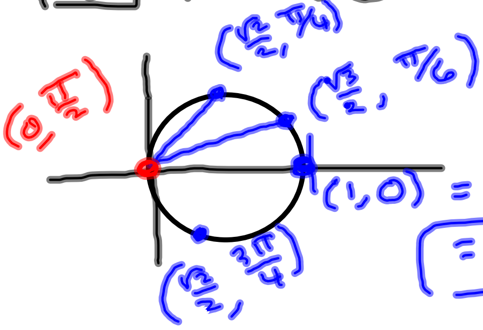
y-axis

Graphs in Polar Coordinates

$r = f(\theta)$



$\boxed{E}$ $r = \cos\theta$



$(1,0) = (f(0), 0)$

$\boxed{= (f(\pi), \pi)} \to r = f(\theta) = \cos\theta$

$f(\pi) = -1$!?

$x = r\cos\theta$

$\cos\theta = \frac{x}{r} = r \Rightarrow$ $x^2 + y^2 = r^2$

$x = r^2$

$x^2 + y^2 = x$

$\boxed{\tan\theta = \frac{y}{x}}$

$x^2 - x + \left(\frac{1}{2}\right)^2 + y^2 = 0 + \frac{1}{4}$

Aaron

$\left(x - \frac{1}{2}\right)^2 + y^2 = \frac{1}{4}$

circle !?

Symmetry Pg 680

$r = f(\theta)$ is even func. $\to$ symmetric about polar axis. $\to$ x-axis

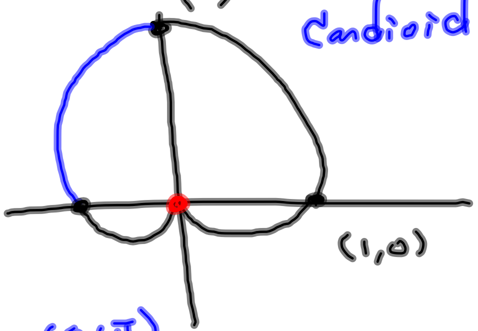
unchanged when r is replaced by $-r$.

Symmetric about pole

unchanged when θ replaced by $\pi - \theta$

symmetric about line $\theta = \frac{\pi}{2}$ $\to$ y-axis

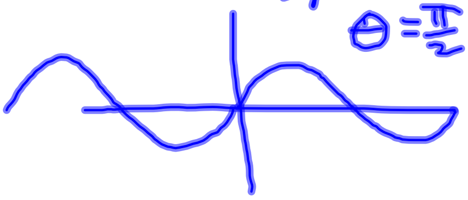
$r = f(\theta) = 1 + \sin\theta$



cardioid

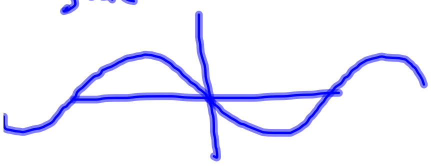
$1 + \sin(\pi - \theta)$ unchanged

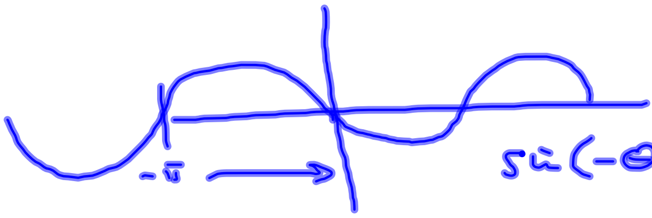
symmetric about $\theta = \frac{\pi}{2}$



$\sin\theta$

$\sin(\theta + \pi)$

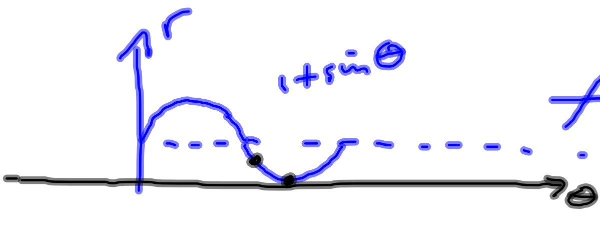


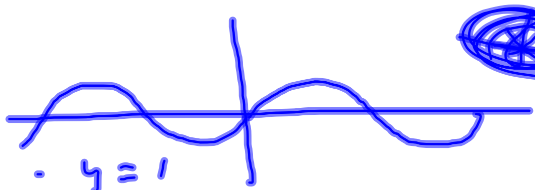


$\sin(-\theta)$

$\sin(\pi - \theta)$

$= \sin(-(\theta - \pi)) = \sin(-\theta + \pi)$





#s 15-20 Identify curve by goin' Cartesian.

15 $r=2$

$r^2=2^2$

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

$x = r\cos\theta$

$y = r\sin\theta$

$x^2+y^2=r^2$

$\tan\theta = \frac{y}{x}$

17 $r = 3\sin\theta$

$r = 3\cdot\frac{y}{r}$

$\frac{1}{3}r^2 = y$

$r^2 = 3y$

$x^2+y^2=3y$

$x^2+y^2-3y+\left(\frac{3}{2}\right)^2 = 0 + \frac{9}{4}$

$x^2+\left(y-\frac{3}{2}\right)^2=\left(\frac{3}{2}\right)^2$

circle, radius $\frac{3}{2}$, $(h,k) = \left(0,\frac{3}{2}\right)$

(20) $r = \sec\theta \tan\theta = \dfrac{\sin\theta}{\cos^2\theta}$

$\Rightarrow r\cos^2\theta = \sin\theta$

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

$(r\cos\theta)^2 = r\sin\theta$

$x^2 = y$

#s 21–26 Go the other way.

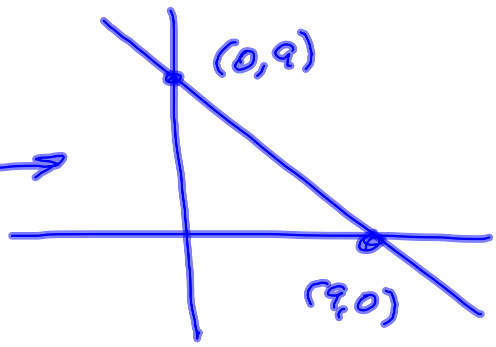
(21) $x = 3 = r\cos\theta \Rightarrow$

$r = \dfrac{3}{\cos\theta} = \boxed{3\sec\theta = r}$

(24) $x + y = 9$

$r\cos\theta + r\sin\theta = 9$

$\boxed{r = \dfrac{9}{\cos\theta + \sin\theta}} \rightarrow$



#s 29-48 Sketch

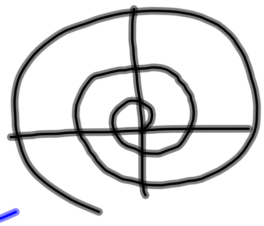
(30) $r^2 - 3r + 2 = 0$

$(r-2)(r-1) = 0$

$r = 1, \ r = 2$ Two circles !

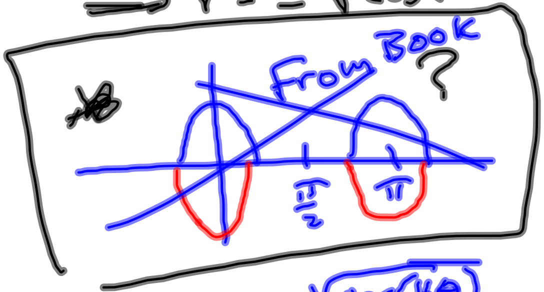
(35) $r = \theta$

A spiral



(49) $r^2 = \cos(4\theta)$

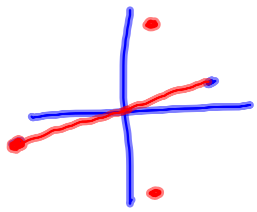
$\Longrightarrow r = \pm\sqrt{\cos(4\theta)}$

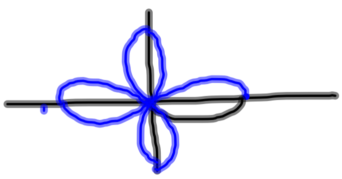


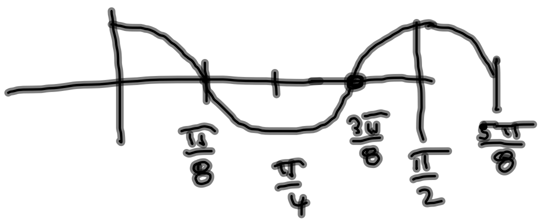
$r = \sqrt{\cos(4\theta)}$

① Symmetric about pole

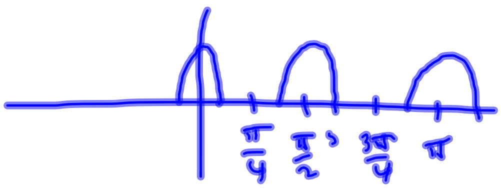
② Symmetric " polar axis







$r^2 = \cos(4\theta)$



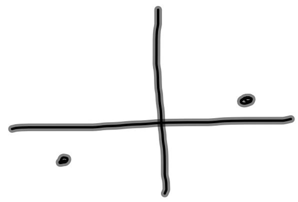
54 $(x^2+y^2)^3 = 4x^2y^2$

$(r^2)^3 = 4r^2\cos^2\theta \, r^2\sin^2\theta$

$r^6 = 4r^4\cos^2\theta\sin^2\theta$

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

$|r| = 2|\cos\theta\sin\theta|$



$r = \pm 2\cos\theta\sin\theta$

$r = \pm\sin(2\theta)$

$r = \pm\sin(2\theta)$

r by −r changes nothing

θ by −θ " "

θ by π−θ " "

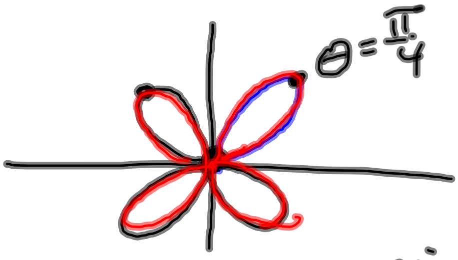
POLE

POLAR AXIS

$\theta = \frac{\pi}{2}$

$\sin(2(\pi-\theta)) = \sin(2\pi - 2\theta) = \sin(-2\theta)$

& replacing θ by −θ changes nothing



$\sin\left(2\left(\frac{3\pi}{4}\right)\right) = \sin\frac{3\pi}{2} = -1$

$\sin\left(2\left(\frac{\pi}{2}\right)\right) = \sin\pi$