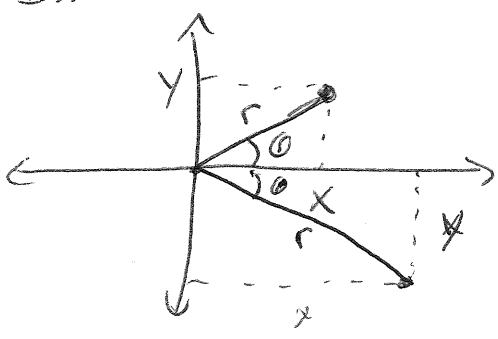


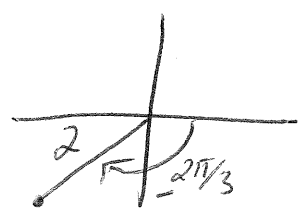
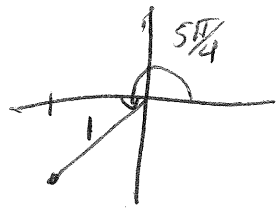
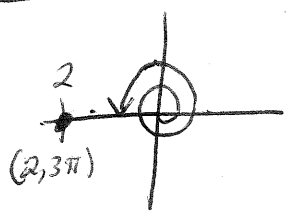
Section 11.3 - Polar Coordinates, Section 11.4 - Graphing

Instead of (x, y) we use (r, θ)

both describe the same point in \mathbb{R}^2



Plot: $(2, 3\pi)$, $(1, 5\pi/4)$, $(2, -2\pi/3)$




Relationship: $\cos \theta = \frac{x}{r}$ $\sin \theta = \frac{y}{r}$

$\Rightarrow x = r \cos \theta, y = r \sin \theta$

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

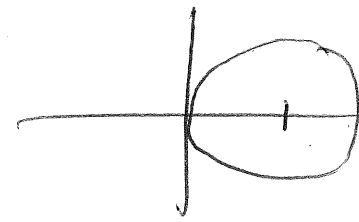
Convert: $(2, \pi/3)$ to Cartesian $(1, \sqrt{3})$
 $(1, -1)$ to Polar $(\sqrt{2}, -\pi/4)$
 $(\sqrt{2}, \pi/4)$

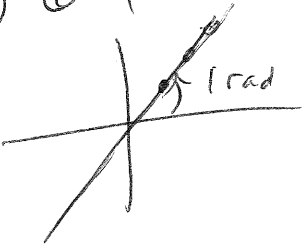
The graph is given by $r = f(\theta)$

Ex) $r = 2$
 all points sit at $(2, \theta)$
 \Rightarrow circle 

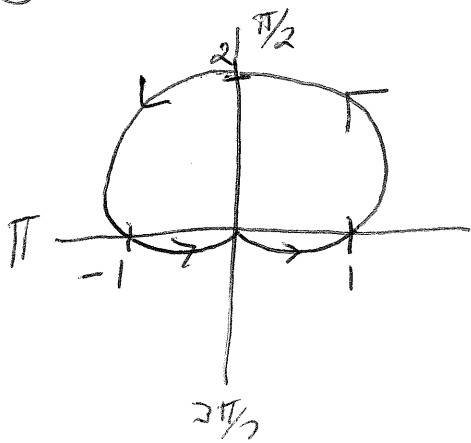
Ex) $r = 2 \cos \theta$ plot pts

$\Rightarrow \cos \theta = \frac{r}{2}$
 $\Rightarrow \frac{x}{r} = \frac{r}{2}$
 $\Rightarrow 2x = r^2$
 $\Rightarrow 2x = x^2 + y^2$
 $\Rightarrow (x-1)^2 + y^2 = 1$



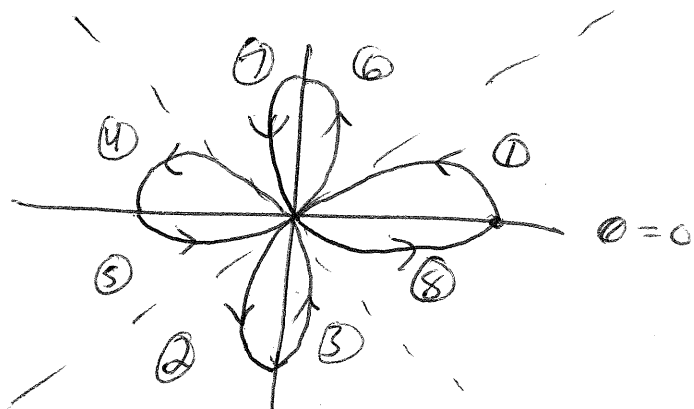
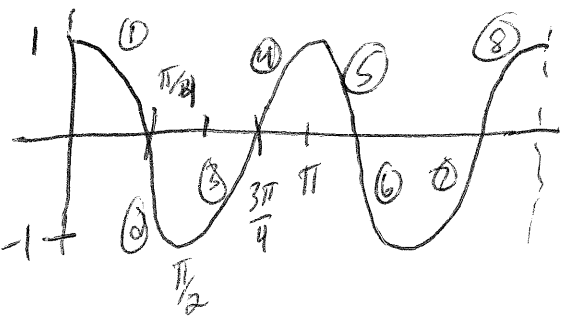
Ex) $\theta = 1$ $(r, 1)$


Sketch $r = 1 + \sin \theta$



Cardioid

Sketch $r = \cos 2\theta$



4-leaved rose