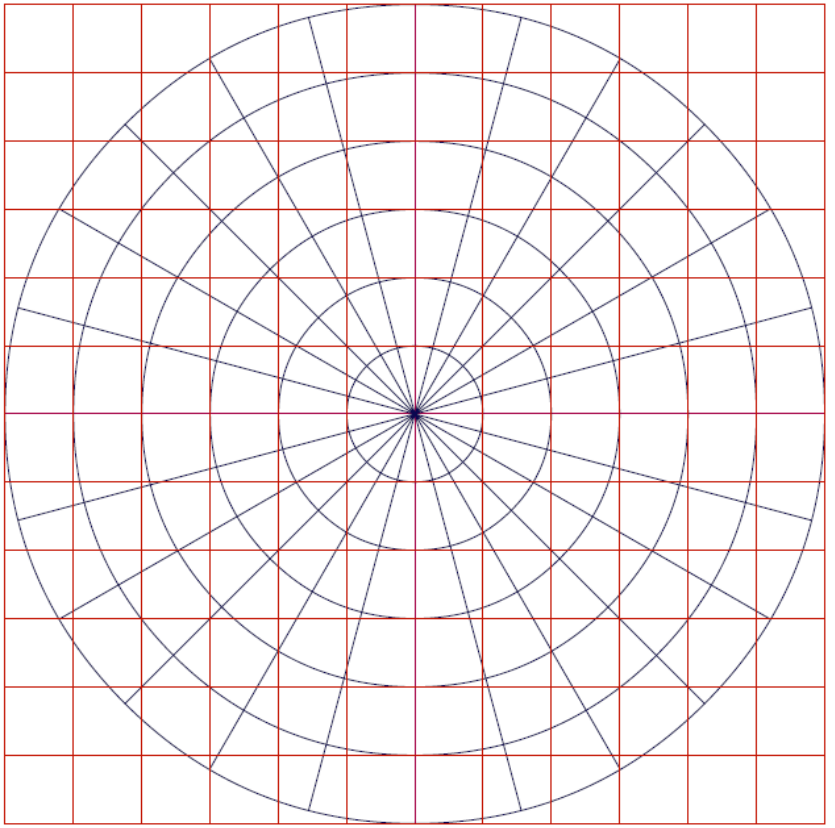
Close Tue: 10.3
Close Thu: 14.1, 14.3 (part 1)
Exam 1 will be returned Tuesday.
Read posted solutions, review exam, do not email about grading.

Entry Task: Plot these polar points

(1) $(r, \theta) = (2, -\pi/4)$
(2) $(r, \theta) = (1, 2\pi/3)$
(3) $(r, \theta) = (-1, \pi/4)$

10.3 Polar Coordinates

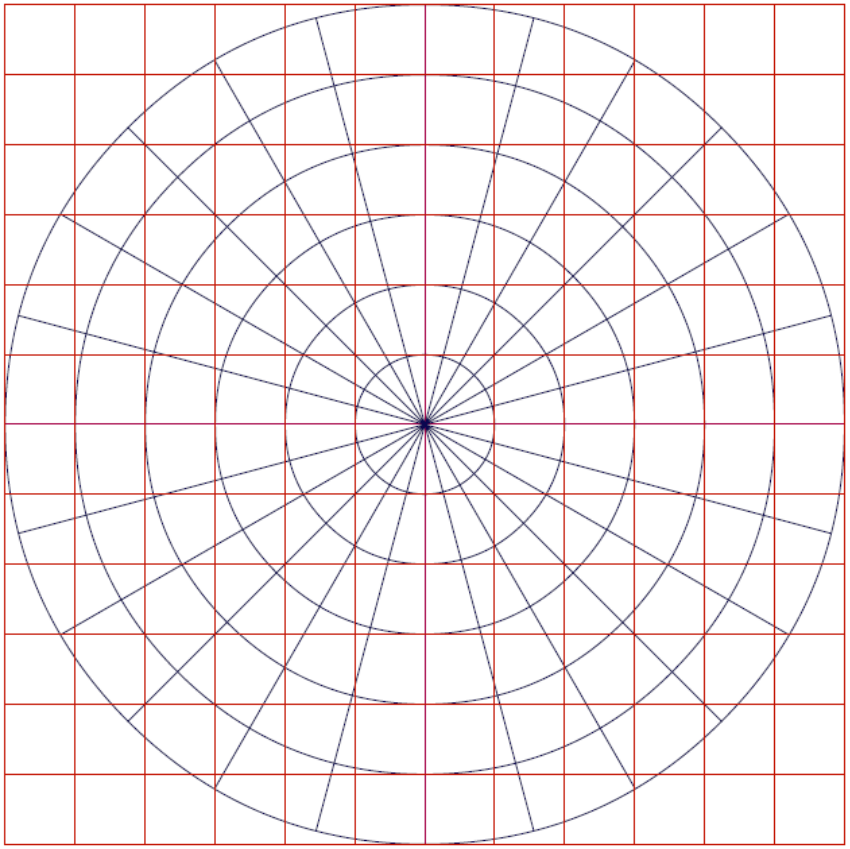
Polar
Given (r, θ) 1. Stand at origin facing the positive *x*-axis.
2. Rotate by θ. pos. = ccw, neg. = clockwise
3. Walk *r*-units in direction you are facing. pos. = forward neg. = backward



From trig we already know:

$$x = r\cos(\theta), \qquad y = r\sin(\theta)$$

$$\tan(\theta) = \frac{y}{x}, \qquad x^2 + y^2 = r^2$$



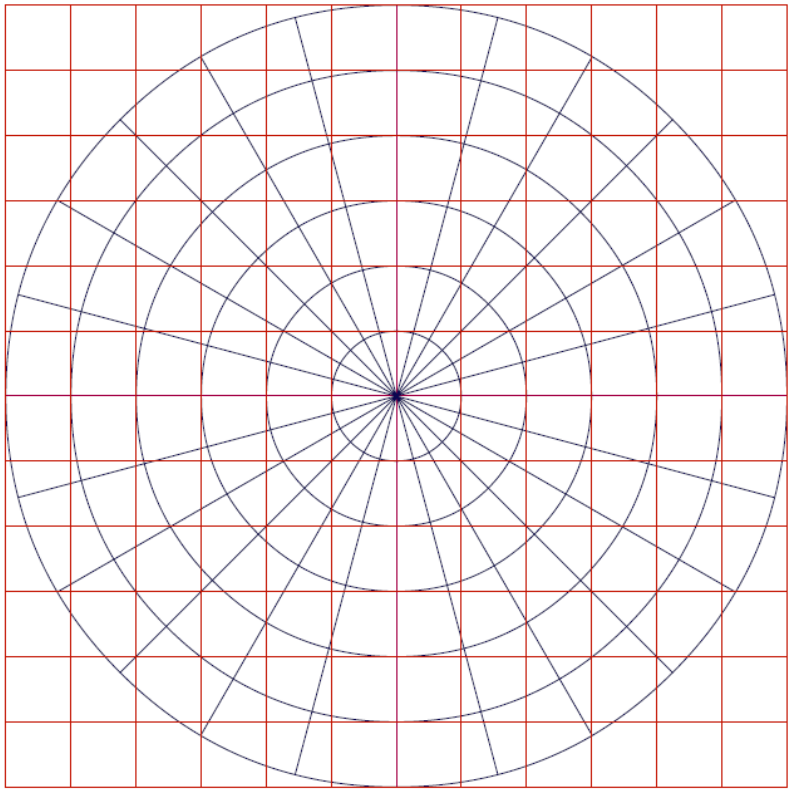
Exercise:

1. Describe all pts where $r = 3$.

2. Describe all pts where $\theta = \pi/4$.

Polar Regions

1. Describe all pts where
$$-\frac{\pi}{4} \leq \theta \leq \pi \text{ and } 1 \leq r \leq 3$$



2. Describe all pts where
$$0 \leq \theta \leq 2\pi \text{ and } 0 \leq r \leq 2$$

Plotting Polar Curves

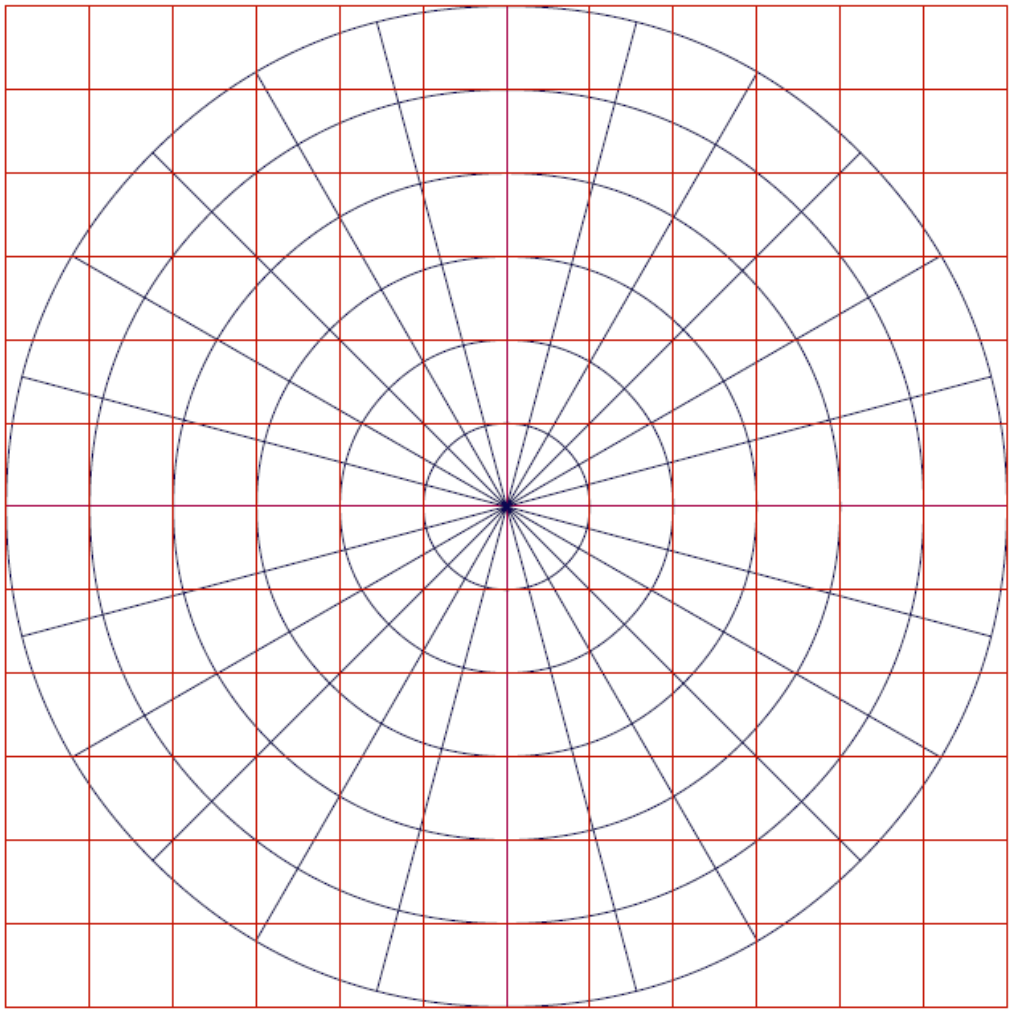
Option 1: Try to convert to x and y.
Then hope you recognize the curve.

Option 2: **Plot points!**
Start with 0, π/2, π, 3π/2 (intercepts).
For more detail do multiples of π/6
and π/4.

Example: Graph r = sin(θ)

θ	0	π/2	π	3π/2	2π
r					

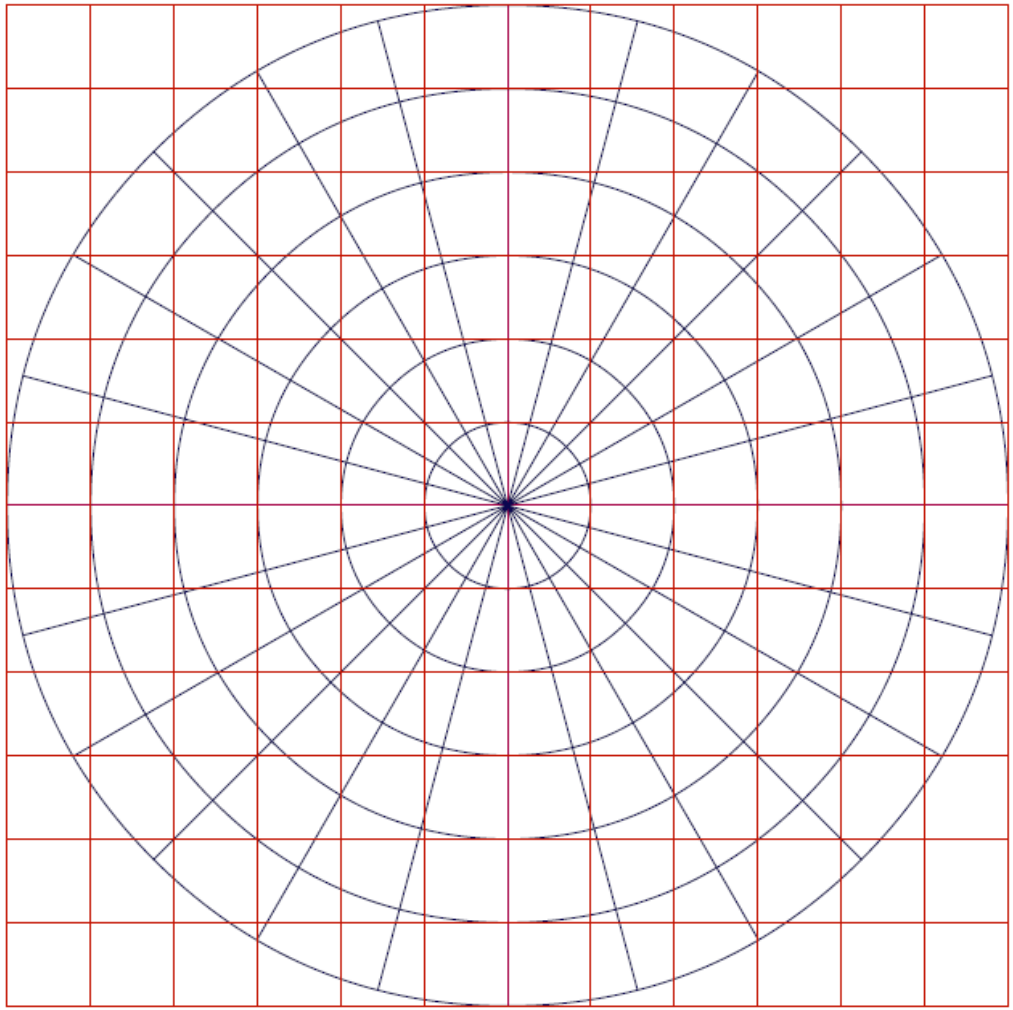
θ	π/6	π/4	π/3	2π/3	3π/4	5π/6
r						



Example: Graph r = cos(2θ)

θ	0	π/2	π	3π/2	2π
r					

θ	π/6	π/4	π/3	2π/3	3π/4	5π/6
r						



Question: Give “bounds” that describe “one loop”.

An old exam question:

The four polar equations below each match up with one of the six pictures. Identify which match.

1. $r = \sqrt{\theta}$
2. $r = 1 - 2\cos(\theta)$
3. $r = 1 + \sin(2\theta)$
4. $r = 9\cos(\theta)$