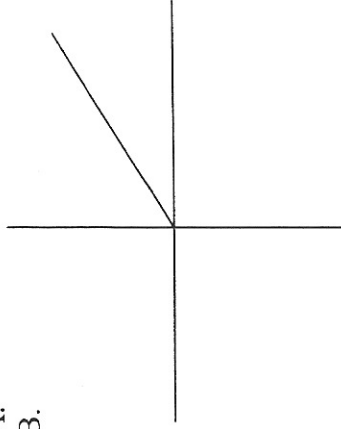


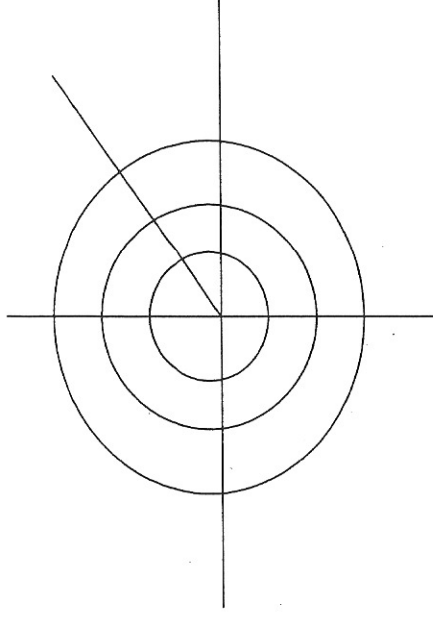
Day 1 11.5

I. Polar Coordinates

- A.
B.



B. The Polar Plane



II. Converting Polar to Rectangular

Given (r, θ) , then

$$x = r \cos \theta \text{ and } y = r \sin \theta$$

III. Converting Rectangular to Polar

Given $P(x, y)$, then

$$r = \sqrt{x^2 + y^2} \text{ and } \theta = \tan^{-1} \frac{y}{x} \text{ or } \tan^{-1} \frac{y}{x} + \pi \text{ if } x < 0$$

IV. Renaming Polar Coordinates

(r, θ) is equivalent to:

- A) $(r, \theta \pm 2\pi n)$
B) $(-r, \theta \pm \pi)$

Plot each point given in polar coordinates.

1. $(6, 50^\circ)$ 2. $(-2, 120^\circ)$

3. $(3, \frac{\pi}{4})$

4. $(5, -40^\circ)$

Convert the polar coordinates to rectangular coordinates.

5. $(2, \frac{5\pi}{6})$

6. $(1, 3)$

7. $(2, 40^\circ)$

Convert the rectangular coordinates to polar coordinates

8. $(1, -1)$

9. $(-1, \sqrt{3})$

10. $(-2.1, -1.5)$

I. Polar Equations and Graphs

A. Lines

1. $\theta = \alpha$
2. $r \cos \theta = a$
3. $r \sin \theta = b$

B. Circle

1. $r = a$
2. $r = a \cos \theta$
3. $r = a \sin \theta$

C. Cardioid

1. $r = a \pm a \cos \theta$
2. $r = a \pm a \sin \theta$

D. Limocon

1. $a \pm b \cos \theta$
2. $a \pm b \sin \theta$

E. Lemniscate

1. $r^2 = a^2 \cos(2\theta)$
2. $r^2 = a^2 \sin(2\theta)$

F. Spiral of Archimedes

$r = a\theta$, must be in radians

G. Rose

A. Odd Angle

1. $r = a \sin(3\theta)$
2. $r = a \cos(3\theta)$

B. Even Angle

1. $r = a \sin(2\theta)$
2. $r = a \cos(2\theta)$

Examples on a handout

I. Lines in Polar Form

A. $\theta = \alpha$

B. $r \cos \theta = a$

C. $r \sin \theta = b$

II. Circles in Polar Form

A. $r = a$

B. $r = a \cos \theta$

C. $r = a \sin \theta$

III. Cardioid

A. $r = a + a \cos \theta$

B. $r = a - a \sin \theta$

IV. Rose

A. $r = a \cos(2\theta)$

B. $r = a \cos(3\theta)$

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

$r = a \sin(3\theta)$

Finding Rose Petal Tips	Finding Rose Petal Widths
1. For odd angles, replace r with a and solve for θ	Replace r with 0 and solve for θ
2. For even angles, replace r with $\pm a$ and solve for θ	

Convert each equation to polar form.

1. $5x^2 + 5y^2 = 7$

2. $y^2 = 3x$

3. $y = 6$

Convert each equation to rectangular form

4. $r = \sin \theta$

5. $r^2 = \sin \theta$

6. $r = 5$

7. $r \cos \theta = 8$

8. $\theta = \frac{\pi}{6}$

Graph each polar equation.

9. $r = 2 \cos \theta$

10. $r = 5 + 5 \sin \theta$

11. $r = 5 \sec \theta$

12. $r = 3$

13. $r = 4 \sin 3\theta$

Find the intersection of the two polar curves. Express the solution in the form (r, θ) .

14. $r = 1 + \cos \theta$ and $r = 1 - \cos \theta$

15. $r = 2 - 3 \cos \theta$ and $r = \cos \theta$

16. $r = 4 \sin \theta$ and $r = 2$