Course Number

Instructor

Date

Section 10.7 Polar Coordinates

Objective: In this lesson you learned how to plot points in the polar coordinate system and write equations in polar form.

What you should learn
How to plot points on the polar coordinate system

I. Introduction (Pages 777–778)

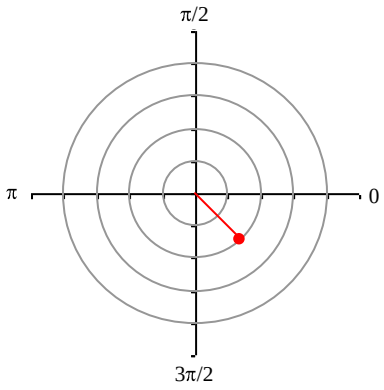
To form the **polar coordinate system** in the plane, fix a point O, called the pole or origin, and construct from O an initial ray called the polar axis. Then each point P in the plane can be assigned polar coordinates (r, θ) as follows:

1) $r =$ directed distance from O to P

2) $\theta =$ directed angle, counterclockwise from polar axis to the segment from O to P

In the polar coordinate system, points do not have a unique representation. For instance, the point (r, θ) can be represented as $(r, \theta \pm 2n\pi)$ or $(-r, \theta \pm (2n + 1)\pi)$, where n is any integer. Moreover, the pole is represented by $(0, \theta)$, where θ is any angle.

Example 1: Plot the point $(r, \theta) = (-2, 11\pi/4)$ on the polar coordinate system.



Example 2: Find another polar representation of the point $(4, \pi/6)$.

Answers will vary. One such point is $(-4, 7\pi/6)$.

II. Coordinate Conversion (Pages 778–779)

What you should learn
How to convert points from rectangular to polar form and vice versa

The polar coordinates (r, θ) are related to the rectangular coordinates (x, y) as follows.

$x = r \cos \theta$ $\quad$ $y = r \sin \theta$

$\tan \theta = y/x$ $\quad$ $r^2 = x^2 + y^2$

Example 3: Convert the polar coordinates $(3, 3\pi/2)$ to rectangular coordinates.

$(0, -3)$

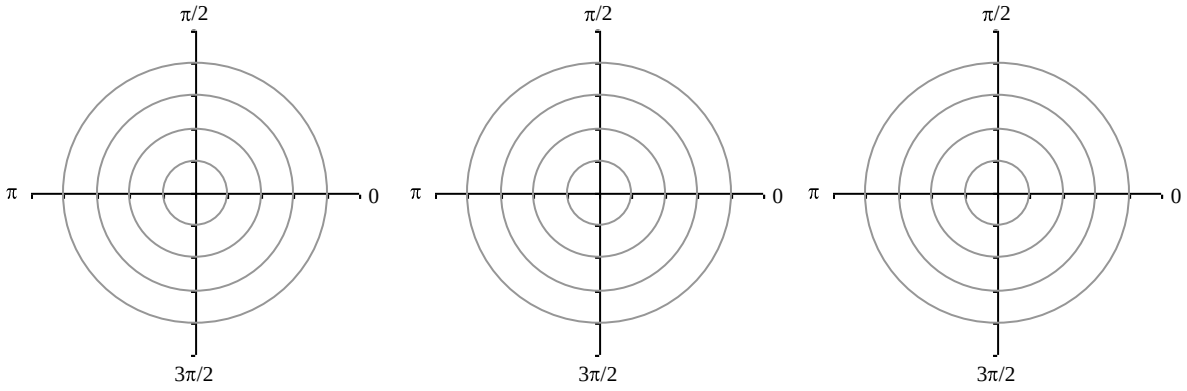
III. Equation Conversion (Page 780)

What you should learn
How to convert equations from rectangular to polar form and vice versa

To convert a rectangular equation to polar form, simply replace x by $r \cos \theta$ and y by $r \sin \theta$, and simplify.

Example 4: Find the rectangular equation corresponding to the polar equation $r = \dfrac{-5}{\sin \theta}$.

$y = -5$



Homework Assignment

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