I2. 8 Parametric Applications

EQ:

1. A cannon shoots from the ground at an angle of 37° with an initial velocity of 300 ft/sec.

Write a set of parametric equations to model the situation.

When is the cannonball 500 feet away?

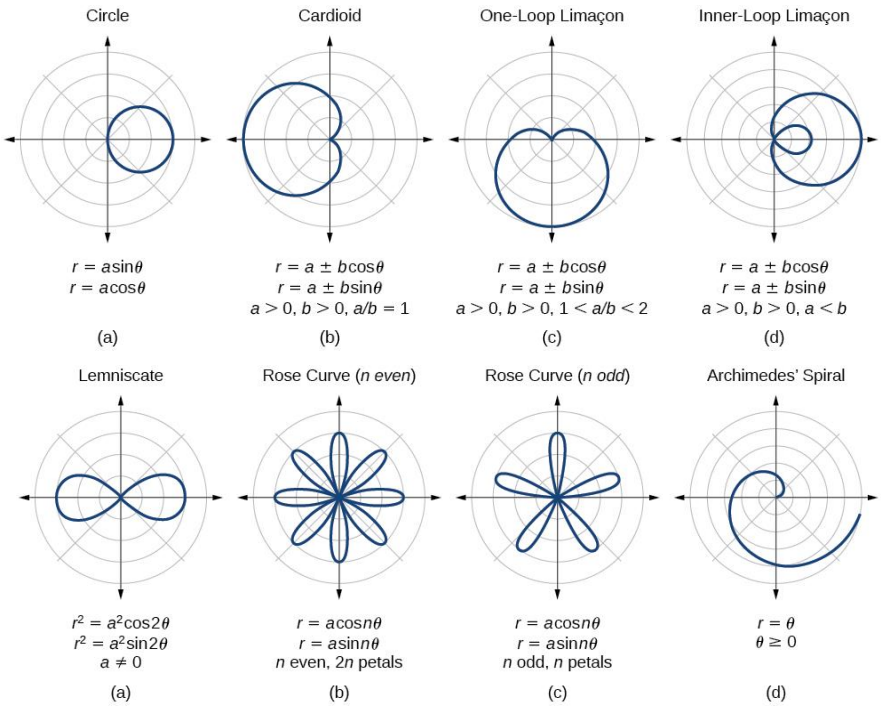
What if the cannon is 4 feet above the ground?

What if there is a wind of 10 ft/sec behind (with) the cannonball?

There is a wall 2500 feet away with a height of 120 feet. Does the cannonball clear the wall?

Unit I2

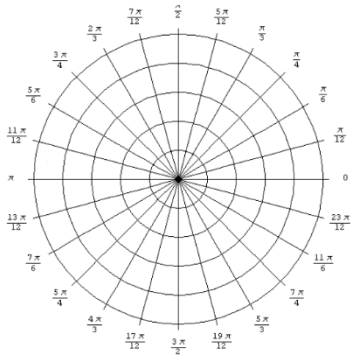
Polar, Parametric, & Vectors



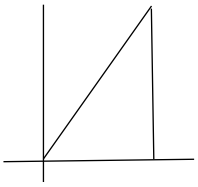
12.1 Polar Basics

EQ:

Rectangular Coordinates: $P\left(4, \frac{5\pi}{3}\right)$ $Q\left(3, \frac{7\pi}{6}\right)$



Polar Coordinates: $R\left(-2, \frac{5\pi}{4}\right)$ $S\left(1, -\frac{\pi}{3}\right)$



$\cos\theta =$

$\sin\theta =$

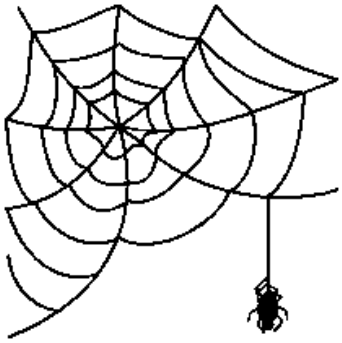
$\tan\theta =$

$x^2 + y^2 =$

CONVERSIONS

POLAR TO RECTANGULAR:

RECTANGULAR TO POLAR:



The Spider and The Fly

The spider is 1T

$x_{1T} = -2T$
$y_{1T} = 5 - 2T$

The fly is 2T

$x_{2T} = 1 - T$
$y_{2T} = 1 + T$

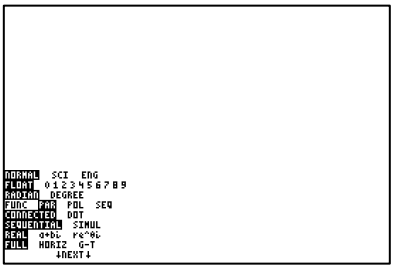
- Change your calculator's mode to RADIANS, PARAMETRIC, and SIMULTANEOUS. This will graph your 2 equations at the same time.
- Change the WINDOW to [-5, 5] by [-5,8] with $0 \le T \le 5$ and Tstep =.05
- Explore the path of the spider and the fly by using the trace button with the up and down arrow keys.

Does the spider catch the fly? Why or why not?

12.7 Parametric Equations in the calculator

Let $f(x) = 2x - 1$

$$x_T = T$$
$$y_T = 2T - 1$$



1. Change your calculator's mode to PARAMETRIC.
2. Type in the above parametric equation into x_{1T} and y_{1T}.
3. Change the window to following:
4. Graph your parametric equation. Make note of the domain & range of the graph.

Tmin = 0
Tmax = 4
Tstep = 0.1
Xmin = -5
Xmax = 5
Xscl = 1
Ymin = -5
Ymax = 5
Yscl = 1

5. Change the value of "Tstep" to .01. What changed about the graph?

6. Change the value of "Tstep" to 1. What changed about the graph?

7. Change the value of "Tstep" back to 0.1. Now change your "Tmax" and "Tmin" values. What changes about the graph?

8. Now graph the parametric function $x_T = \cos T$, $y_T = \sin T$. Predict what will happen when you change your values of Tmin, Tmax, and Tstep.

9. Summarize what happens when you change the values of Tmin, Tmax, and Tstep when graphing parametric equations in your calculator.

Ex 2. Convert $\left(4, \frac{5\pi}{6}\right)$ to rectangular coordinates.

Ex 3. Convert to polar coordinates.

a. $\left(\sqrt{3}, -1\right)$ b. (0,-2) c. (-3, 3)

Ex 4. Convert the following equations to polar form.

a. $x = 3$ b. $x^2 + y^2 = 16$

Ex 5. Convert the following equation to rectangular form and sketch the graph.

a. $r\cos\theta = 3$ b. $\theta = \frac{\pi}{3.}$

I2. 2 Intro to Polar Graphing

Use this space to write down any notes from the desmos.

EQ:

I2. 6 Parametric Basics

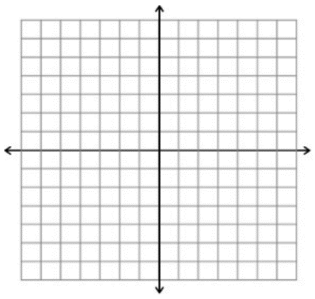
EQ:

Parametric Equation: The coordinates of points are a function of a parameter, called t.

$$\begin{aligned} x &= 3t+1 \\ y &= t-2 \end{aligned} \qquad -1 \le t \le 1$$

a. Graph the parametric equation.

b. Eliminate the parameter



Graph the following equations, with the direction shown, and eliminate the parameter.

1. $\begin{aligned} x &= \cos t \\ y &= \sin t \end{aligned}$

2. $\begin{aligned} x &= 4\cos t \\ y &= 4\sin t \end{aligned}$

3. $\begin{aligned} x &= 4\cos t \\ y &= \sin t \end{aligned}$

4. $\begin{aligned} x &= \cos t \\ y &= 4\sin t \end{aligned}$

5. Find the parametric equation of a line with a slope of 3 and goes through the point (1,4)

I2. 5 Vectors Day 2

EQ:

The Dot Product $u \bullet v = a_1 a_2 + b_1 b_2$

Ex. Find the dot product of u = 2i + j and v = 5i – 6j

*Two vectors are orthogonal (_____) if _____.

Angle between two vectors

$$u \bullet v = \|u\| \|v\| \cos\theta$$

So to find an angle…

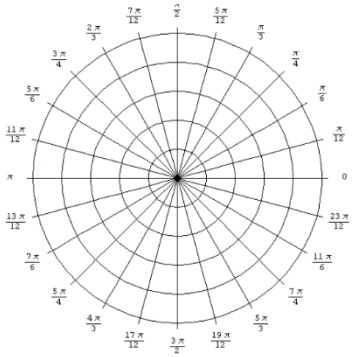
Ex. Find the angle between u = 4i - 3j and v = 2i + 5j

I2. 3 Graphing Polar Equations

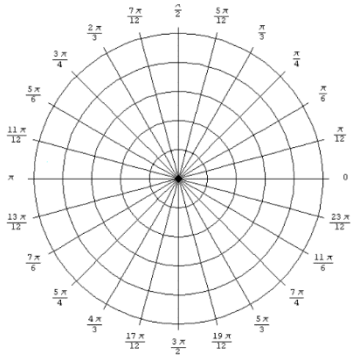
EQ:

Tell what type of graph it is, make a table, and sketch a graph.

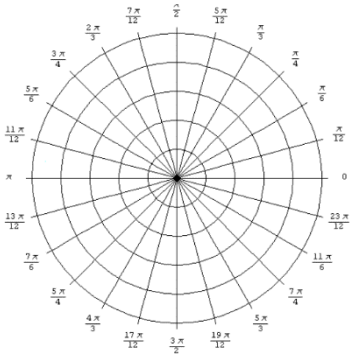
1. $r = -4\cos\theta$



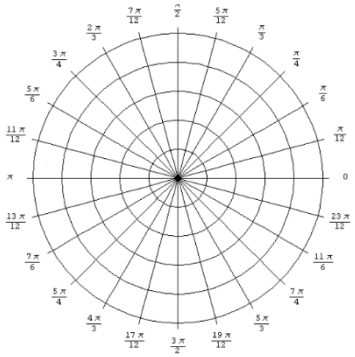
2. $r = 2 + 4\sin\theta$



3. $r = \sin 2\theta$



4. $r = 5\cos 3\theta$



12.4 Vectors Day 1 EQ:

SCALAR	VS.	VECTOR
- a line segment - examples:		- a directed line segment - has a magnitude and direction - examples:

Unit Vector: a vector with a magnitude of one
Zero Vector: a vector with no direction and a magnitude of zero
Position Vector: has an initial point at the origin

Ex. Find the position vector of a vector starting at (-2,5) and terminating at (3,7)

Magnitude: the _____ of a vector

ex.

$$\|v\| = \sqrt{a^2 + b^2}$$

ex. u = 2i – 3j

Vector Operations Part 1

Ex. u = <2, -1> and v = <4,2> Find 2v + 3u and v – u.

Geometrically: Algebraically:

Horizontal and Vertical Components $\cos\theta = \frac{a}{\|v\|}$ OR $a = \|v\|\cos\theta$

Ex. A vector has a magnitude of 8 and direction $\frac{\pi}{3}$.

Find the horizontal & vertical components in i + j form

Ex. Find the magnitude and direction of $u = -\sqrt{3}i + j$