

Thursday, September 5

$\theta = \text{theta}$

What are the different types of polar functions? What does the equation for each function look like?

roses: $r = a \cos(b\theta)$, $r = a \sin(b\theta)$

circles: $r = a \cos \theta$, $r = a \sin \theta$

limacons: $r = a + b \cos \theta$, $r = a + b \sin \theta$

September 5 - Day 2

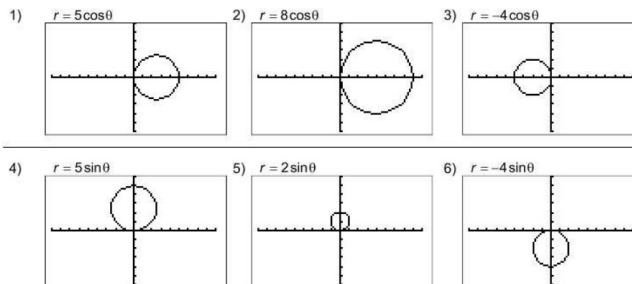
Students will verbally explain how to graph polar functions and identify the different types of graphs

(using the words:
circle, rose, petal, limacon, line...)

Polar Equations with Technology (pp. 1 of 4)

NORMAL SCI ENG FLAT 0 1 2 3 4 5 6 7 8 9 RADIAN DEGREE FUNC PAR 2D SEQ	$\sqrt{x} \square 4 \sin(\theta)$ $\sqrt{x} 2 =$ $\sqrt{x} 3 =$	WINDOW $\theta_{\min} = 0$ $\theta_{\max} = 6.2831853...$ $\theta_{\text{step}} = .1308996...$
To graph polar equations in a calculator, change the MODE to <i>radian</i> and <i>polar</i> ("POL").	Notice that the "Y=" menu now lists "r=" equations, and the [X,T,θ,n] button gives θ as the independent variable.	Also, in adjusting the WINDOW, additional settings are required for values of θ.

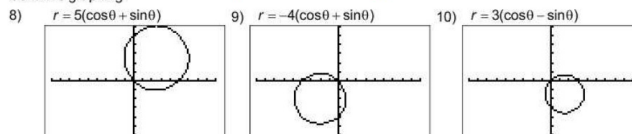
Using the θ-settings given above (θmin = 0, θmax = 2π, θstep = π/24), in a window [-9, 9] by [-6, 6], sketch the graph each of the following equations.



- 7) Explain the characteristics (size, shape, location) of graphs made from polar equations of the form $r = a \cos \theta$ and $r = a \sin \theta$.

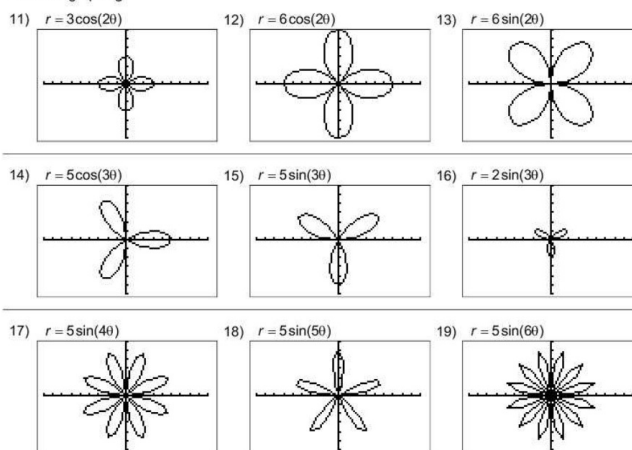
a is the size (diameter) of circle.
cos θ is on x-axis
sin θ is on y-axis
positive a: top/right
negative a: bottom/left

Continue graphing.



Polar Equations with Technology (pp. 2 of 4)

Continue graphing.



- 20) Polar equations of the form $r = a \cos(b\theta)$ and $r = a \sin(b\theta)$ (items #11 through 19) are called *roses*. Discuss your observations on how differences in the equations affect each rose's graph.

A) What is the effect of a on the graphs of $r = a \cos(b\theta)$ and $r = a \sin(b\theta)$?

length of each petal

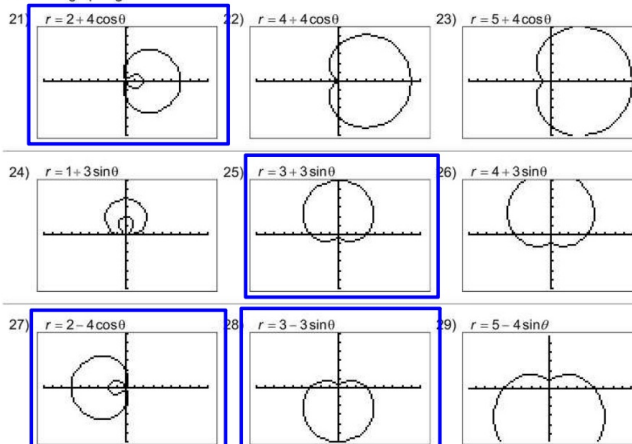
B) What is the effect of b on the graphs of $r = a \cos(b\theta)$ and $r = a \sin(b\theta)$?

even: twice the number of petals
odd: total number of petals

C) How do the cosine graphs differ from the sine graphs?

Polar Equations with Technology (pp. 3 of 4)

Continue graphing.



- 30) A polar equation of the form $r = a \pm b \cos \theta$ or $r = a \pm b \sin \theta$ (items #21 through 29) is called a *limaçon* (from a French word meaning "snail"). Discuss your observations on how differences in the equations affect the graph of each limaçon.

A) How do the cosine graphs differ from the sine graphs?

B) How do the equations with minus signs differ from those with plus signs?

C) Under what conditions does the limaçon have an inner loop?

$b > a$