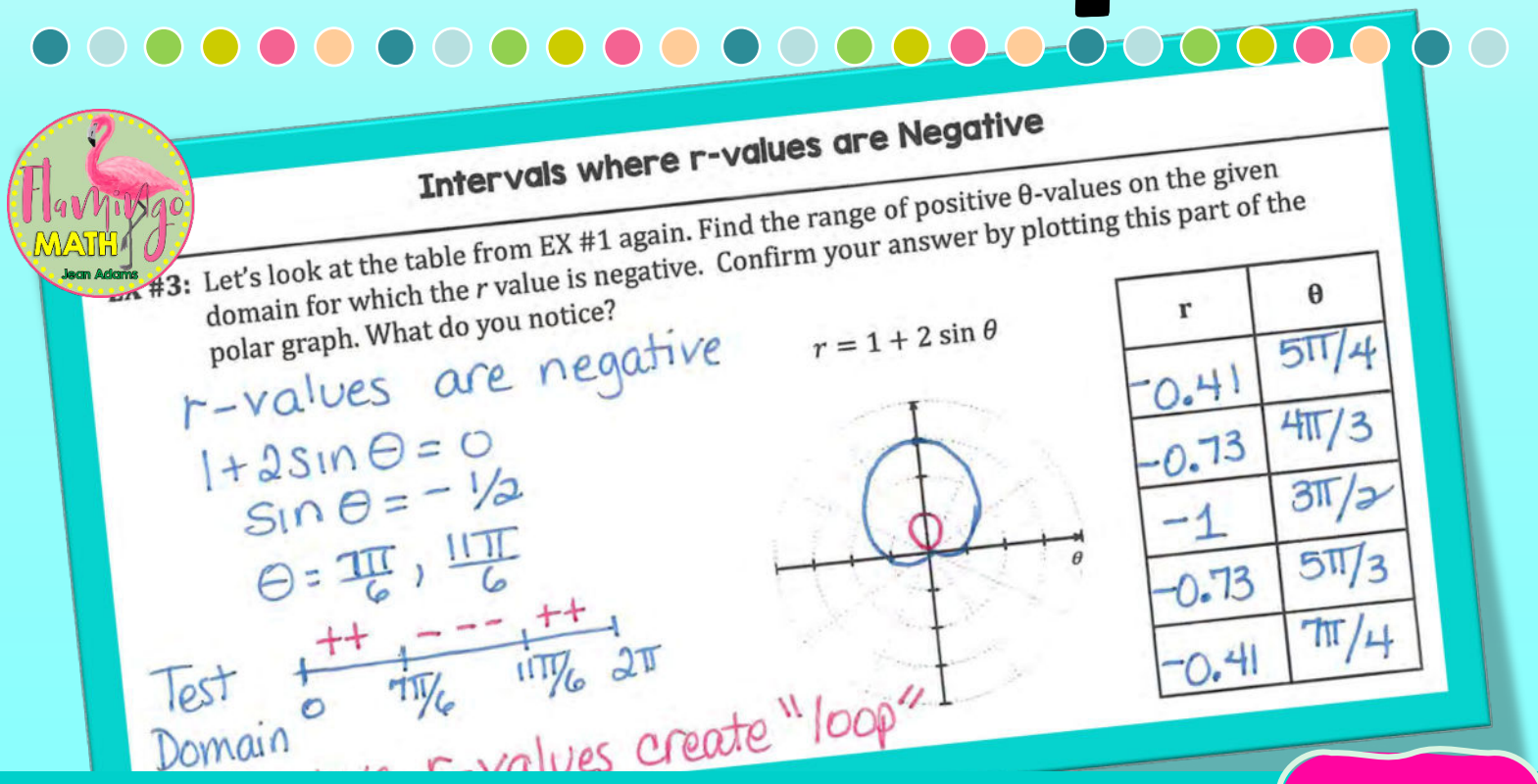
Precalculus Honors

More About Polar Graphs



Completely Editable 6.3

Lesson 6.3: More About Polar Graphs

This lesson is an extension of three additional skills needed for students who have plans to continue into Calculus topics. In PreCalculus, we will set the foundation for later courses by considering those needed skills, namely:

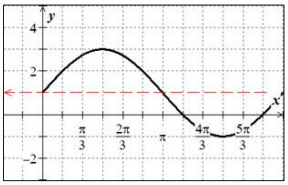
1. The domain restrictions for completing one cycle of a polar graph,
2. Finding where the *r*-values are negative; and,
3. Finding the points of intersection of two polar graphs and any common points.

Domain Restrictions

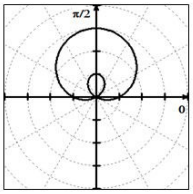
EX #1: Consider the function

x	y
0	
$\frac{\pi}{6}$	
$\frac{\pi}{4}$	
$\frac{\pi}{3}$	
$\frac{\pi}{2}$	
$\frac{2\pi}{3}$	
$\frac{3\pi}{4}$	
$\frac{5\pi}{6}$	
π	

x	y
$\frac{7\pi}{6}$	
$\frac{5\pi}{4}$	
$\frac{4\pi}{3}$	
$\frac{3\pi}{2}$	
$\frac{5\pi}{3}$	
$\frac{7\pi}{4}$	
$\frac{11\pi}{6}$	
2π	

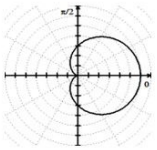


This is the corresponding polar graph $r = 1 + 2\sin\theta$. How can the table be used to graph the polar curve?

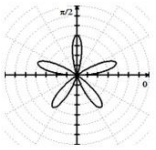


EX #2: Determine the domain restrictions for sketching the polar curve through one cycle. Use the auxiliary graph of the corresponding rectangular function to assist you.

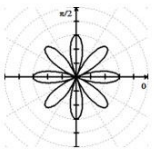
A. $r = 3 + 3\cos(\theta)$



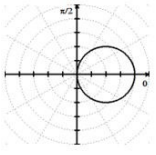
B. $r = 4\sin(5\theta)$



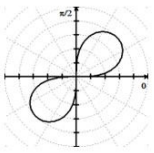
C. $r = 3\cos(4\theta)$



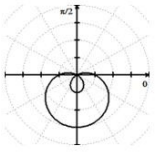
D. $r = 4\cos(\theta)$



E. $r^2 = 16\sin(2\theta)$



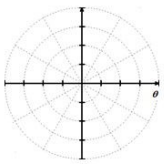
F. $r = 1 - 2\sin(\theta)$



Intervals where r-values are Negative

EX #3: Let's look at the table from EX #1 again. Find the range of positive θ-values on the given domain for which the *r* value is negative. Confirm your answer by plotting this part of the polar graph. What do you notice?

$r = 1 + 2\sin\theta$



r	θ

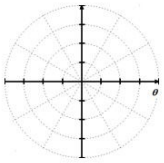
EX #4: Use the rectangular graph $y = 2\cos(x) - 1$ to:

A. Find the range of positive *x*-values on the given domain for which the *y*-value is negative.

B. State the domain for one complete cycle to sketch the polar graph.

C. What symmetry, if any, applies to the curve?

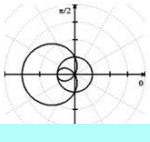
D. Sketch the polar curve.

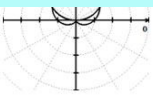


Intersections of Polar Graphs

Points of intersection can be found algebraically. There can also be common points that are not part of the solution set.

EX #5: Find the points of intersection of the graphs of $r = 1 - 2\cos(\theta)$ and $r = 1$. State the solutions and any common points.





NOTES

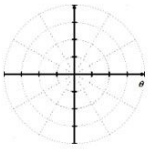
6.3 **More About Polar Graphs Homework**

Name _____

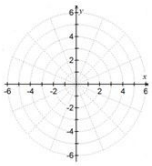
Date _____ Period _____

Problems 1 – 6, plot each polar curve to find the first range of positive θ-values for which r is negative. Confirm your answer by plotting the graph on the grid provided.

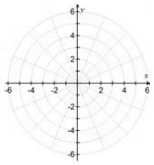
1. $r = 1 - 2\cos\theta$



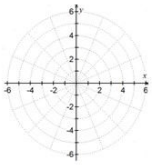
2. $r = 2 - 4\sin\theta$



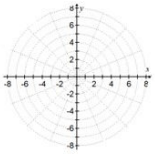
3. $r = 5\sin(3\theta)$



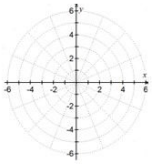
4. $r = 4\cos(2\theta)$



5. Calculator: $r = 2 - 5\cos\theta$

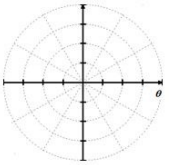


6. Calculator: $r = 1 - 5\sin\theta$

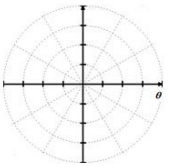


Problems 7-10, Graph each system of polar equations and solve the system algebraically. State whether each point of intersection is a solution or a common point.

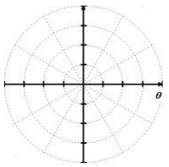
7. $r = 2 + 2\cos\theta$
$r = 3$



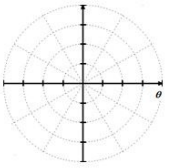
8. $r = 2 + 2\cos\theta$
$r = 4\cos\theta$



9. $r = 2 - 2\sin\theta$
$r = 2\sin\theta$

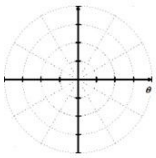


10. $r = 4\cos(2\theta)$
$r = 4$

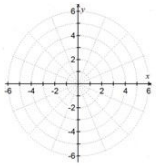


Problems 11-14, Graph each system of polar equations and solve the system using an auxiliary graph with a graphing utility. State whether each point of intersection is a solution or a common point.

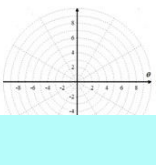
11. $r = \sin\theta$
$r = \sin(2\theta)$

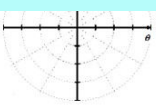


12. $r = 3 + \cos\theta$
$r = 5\sin(2\theta)$



13. $r = 4 + 4\cos\theta$
$r = 10\cos\theta$





Practice Sets

Lesson Warm-Ups

3. Graph the system of polar equations and solve algebraically. State whether each point of intersection is a solution or a common point.

$$r = \begin{cases} 1 + 2\cos(\theta) \\ 2 \end{cases}$$

Name _____ Date _____ Period _____

Lesson 6.3A: More about Polar Graphs **Warm-Up # 2**

1. Find the first range of positive θ − values for which r is negative. $r = 4\cos(2\theta)$

2. Identify the domain restrictions for sketching the polar curve through one cycle. $r = 5\sin(4\theta)$

3. Graph the system of polar equations and solve algebraically. State whet
is a solution or a common point.

$$r = \begin{cases} 4 - 4\sin(\theta) \\ 4\sin(\theta) \end{cases}$$

6.3 More About Polar Graphs **Form A**

Name _____

Date _____ Period _____

1. Find the first range of positive θ-values for which r is negative. $r = 4\sin(2\theta)$

2. Identify the domain restrictions for sketching the polar curve through one cycle. $r = 5\cos(3\theta)$

3. Graph the system of polar equations and solve algebraically. State whether each point of intersection is a solution or a common point.
$r = 3 - 3\cos\theta$
$r = 3\cos\theta$

Grade:

6.3 More About Polar Graphs **Form B**

Name _____

Date _____ Period _____

1. Find the first range of positive θ-values for which r is negative. $r = 5\cos(3\theta)$

2. Identify the domain restrictions for sketching the polar curve through one cycle. $r = 3\sin(4\theta)$

3. Graph the system of polar equations and solve algebraically. State whether each point of intersection is a solution or a common point.
$r = 4\sin 2\theta$
$r = 4$

Grade:

Daily Lesson Quiz