

# Form Meets Function: Polar Graphing Project

You will create a unique design using the graph of a single polar equation. Not only will your choice of equation determine your individual design, but also your choice of TI-83+ window settings.

## Directions:

1. Create a design depicting a recognizable object (as opposed to an abstract design).
2. Choose a creative title for your design.
3. Use a single polar equation as the basis for your design. You may choose to embellish the background with other shapes, but the polar graph must be the focal point of the design.
4. Accurately plot points for your equation on the polar graph paper provided (plot points at least every 15 degrees). In your table settings, make sure  $\Delta Tbl$  matches the value of your  $\theta_{step}$  so that your plotted points correspond to the graph displayed on your calculator.
5. Fill the polar graph paper as much as possible, and accent your design with color.
6. Your design should exhibit originality, complexity, and creativity. A simple rose curve, for example, is not a complex design. A flower is not highly creative or original. Experiment!
7. Record the equation and TI-83+ window settings used to produce the graph.

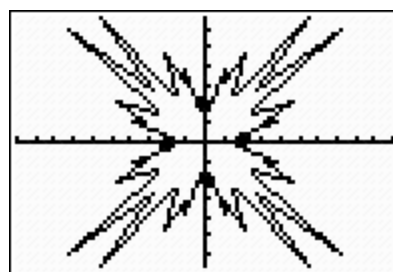
## Examples:

$r = \tan 5\theta^2 + 1 + 3$  Window Setting:  $\theta_{15} 0, 360^\circ$   $X_1 -10, 10$   $Y_1 -6.5, 6.5$

Plot1	Plot2	Plot3
\r1= tan(5θ²+1)+3		
\r2=		
\r3=		
\r4=		
\r5=		
\r6=		

$\theta$	r1
0	3.0175
5	1.6236
10	2.1902
15	4.0355
20	3.3839
25	5.246
30	3.0175

$\theta=0$

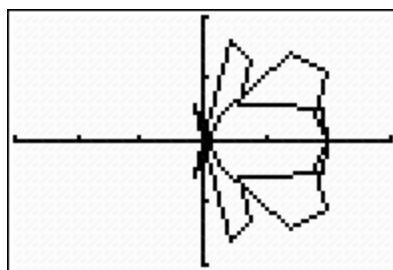


$r = \sin \theta \cos 5\theta + 2 \cos \theta$  Window Setting:  $\theta_{15} 0, 360^\circ$   $X_1 -4.5, 4.5$   $Y_1 -3, 3$

Plot1	Plot2	Plot3
\r1= 1.2sin(θ)cos(5θ)+2cos(θ)		
\r2=		
\r3=		
\r4=		
\r5=		
\r6=		

$\theta$	r1
0	2
15	2.0122
30	1.2124
45	.81421
60	1.5196
75	1.6373
90	0

$\theta=0$



Name: \_\_\_\_\_

Date: \_\_\_\_\_ Pd: \_\_\_\_\_

**Title:** \_\_\_\_\_

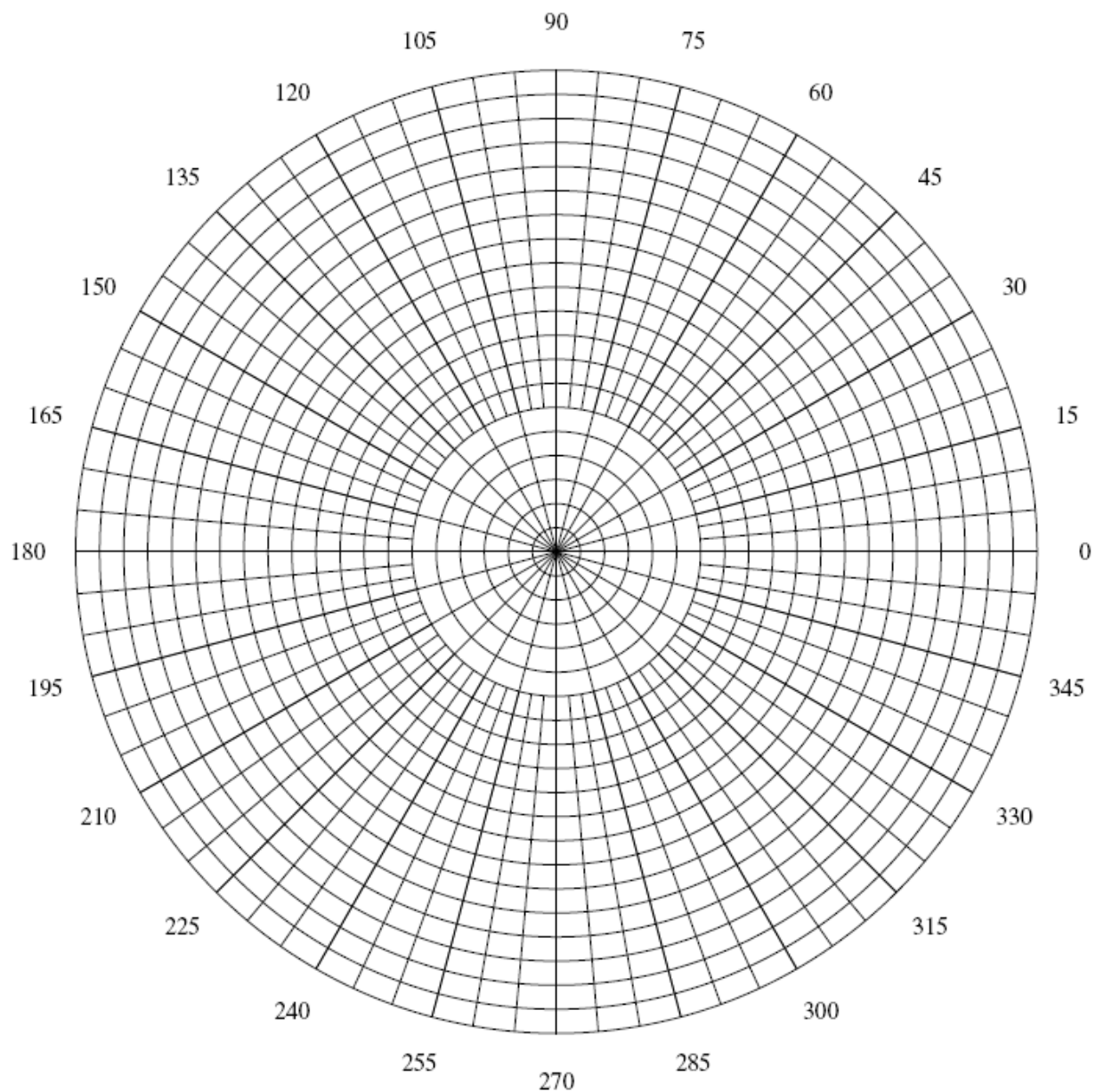
This project is worth a total of 75 points. Of those 75 points, 60 points will be assessed using the project criteria. The remaining 15 points will be assessed based on your responses to the self-reflection questions listed below.

Criteria	Excellent	Satisfactory	Unsatisfactory
Design depicts a recognizable object. Title is creative and is appropriate for the design.	15	10	5
Single polar equation used as the basis for the design. Design fills most of the graph and is accented through coloring.	15	10	5
Equation is correctly graphed and points are accurately plotted using an appropriate scale. Window settings are accurate.	15	10	5
Design exhibits originality, complexity, and creativity.	15	10	5

**Self-Reflection Questions:** (Continue on the back of this sheet if you need more room.)

1. In what ways did you experiment mathematically while working on this assignment?
2. What did you learn from doing this assignment?
3. Did you enjoy working on this assignment? Why or why not?

**Title:**  
**Designed by:**



**Equation:**

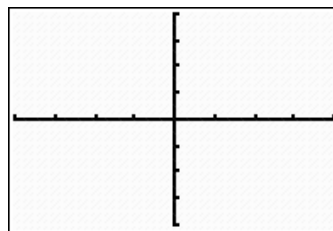
$\theta$  min =       $X$  min =       $Y$  min =  
 $\theta$  max =       $X$  max =       $Y$  max =  
 $\theta$  step =       $X$  scl =       $Y$  scl =

## Graphing Polar Equations

1. Graph the following polar equation using the window settings provided:

Equation:  $r = 2 + 2\cos\theta$

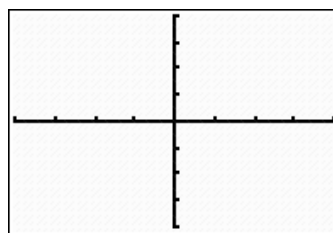
Window :  $\theta_{\pi/12} \ 0, 2\pi \ X_1 \ -4, 4 \ Y_1 \ -4, 4$



2. Now change the  $\theta$ -step to  $\pi/4$  and describe the change in appearance that occurs. Why does the graph appear different?

Equation:  $r = 2 + 2\cos\theta$

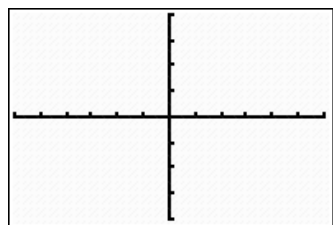
Window :  $\theta_{\pi/4} \ 0, 2\pi \ X_1 \ -4, 4 \ Y_1 \ -4, 4$



3. Now change the minimum and maximum values displayed on the horizontal axis to -6 and 6, respectively. Describe the change in appearance that occurs. Why does the graph appear different?

Equation:  $r = 2 + 2\cos\theta$

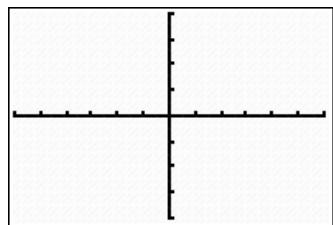
Window :  $\theta_{\pi/4} \ 0, 2\pi \ X_1 \ -6, 6 \ Y_1 \ -4, 4$



4. The minimum and maximum values of  $\theta$  also affect the display of the graph. Change the maximum value of  $\theta$  to  $\pi$ . Describe the change in appearance that occurs. Why does the graph appear different?

Equation:  $r = 2 + 2\cos\theta$

Window :  $\theta_{\pi/4} \ 0, \pi \ X_1 \ -6, 6 \ Y_1 \ -4, 4$



5. Using a square window and a small  $\theta$ -step will give the most accurate display of the graph. Change the  $\theta$ -step to  $\pi/24$  and the maximum value of  $\theta$  to  $2\pi$ .

Equation:  $r = 2 + 2\cos\theta$

Window :  $\theta_{\pi/24} \ 0, 2\pi \ X_1 \ -6, 6 \ Y_1 \ -4, 4$

