Warm-up!

A) In what quadrant is the polar point $\left(-8, \frac{11\pi}{6}\right)$

B) A complex number is represented by a point in the complex plane with coordinates $(-5, 5)$. Which one of the following is one way to express the complex number using its polar coordinates?

- $\left(5\sqrt{2}\cos\left(-\frac{3\pi}{4}\right)\right) + i\left(5\sqrt{2}\sin\left(-\frac{3\pi}{4}\right)\right)$
- $\left(5\cos\left(-\frac{3\pi}{4}\right)\right) + i\left(5\sin\left(-\frac{3\pi}{4}\right)\right)$
- $\left(5\sqrt{2}\cos\left(\frac{3\pi}{4}\right)\right) + i\left(5\sqrt{2}\sin\left(\frac{3\pi}{4}\right)\right)$
- $\left(5\cos\left(\frac{3\pi}{4}\right)\right) + i\left(5\sin\left(\frac{3\pi}{4}\right)\right)$

C) What is the midline, period, and amplitude of the graph of $y = 6 + 3\sin(2x)$.

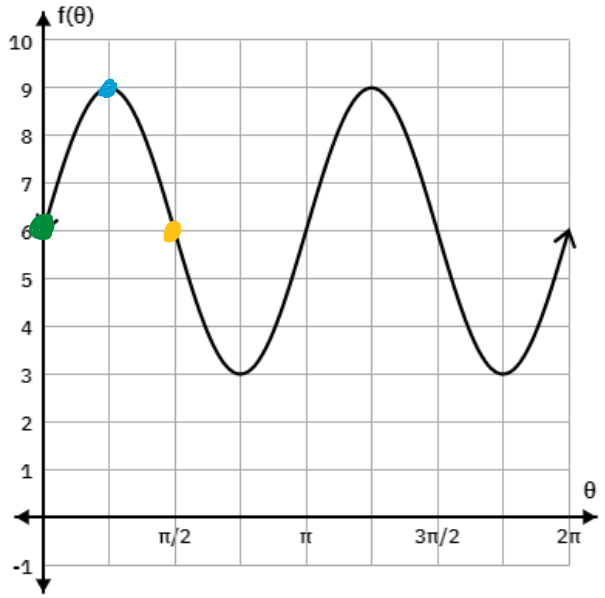
Advanced Trig Day 6:

- (3.14) Converting rectangular graphs to polar graphs
- (3.15) Polar Rate of Change

Homework: Polar Graphs Worksheet

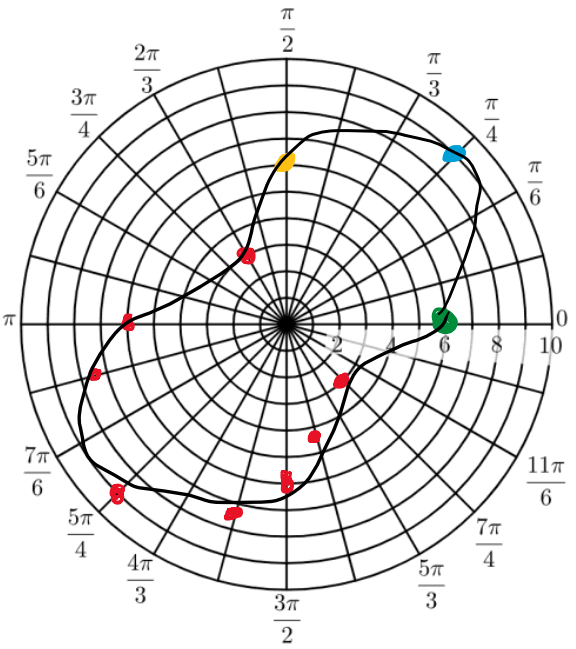
We are used to seeing the relationship between two variables illustrated with a rectangular graph. But we can also illustrate the relationship between two variables with a polar graph.

$$f(\theta) = 6 + 3\sin(2\theta)$$

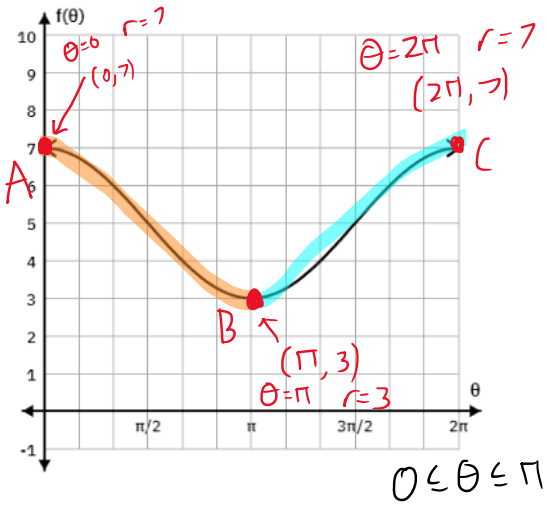


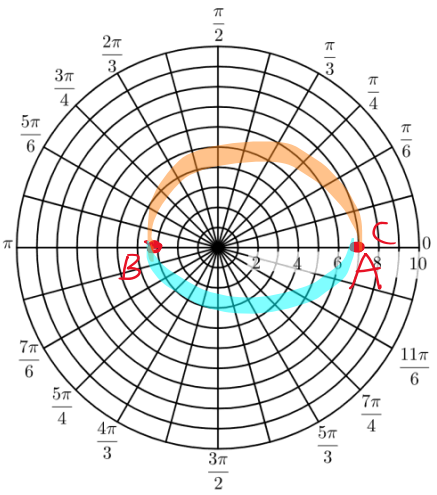
θ	$f(\theta)$
0	6
$\frac{\pi}{4}$	9
$\frac{\pi}{2}$	6
$\frac{3\pi}{4}$	3
π	6
$\frac{13\pi}{12}$	7.5
$\frac{5\pi}{4}$	9
$\frac{17\pi}{12}$	7.5
$\frac{3\pi}{2}$	6
$\frac{19\pi}{12}$	4.5
$\frac{7\pi}{4}$	3
2π	6

$$r = f(\theta)$$



Consider $f(\theta) = 5 + 2\cos(\theta)$. Pick convenient points from the rectangular representation of this relationship. Plot points on the polar graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.





From $0 \le \theta \le 2\pi$, over what interval is r…
Positive and increasing?

Positive and decreasing?

Negative and increasing?

Negative and decreasing?

On the interval $0 \le \theta \le \pi$, does the distance between the polar graph and the origin increase or decrease?

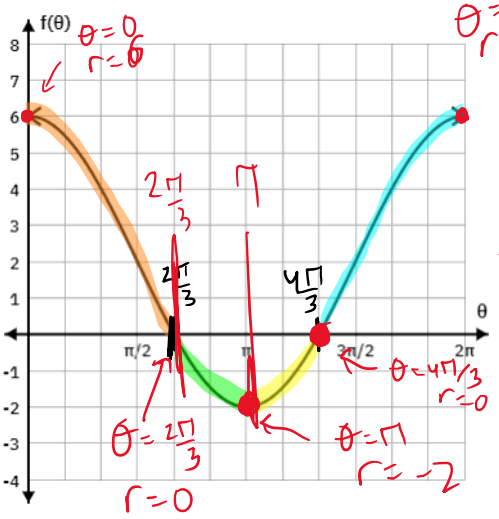
Consider $f(\theta) = 2 + 4\cos(\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.

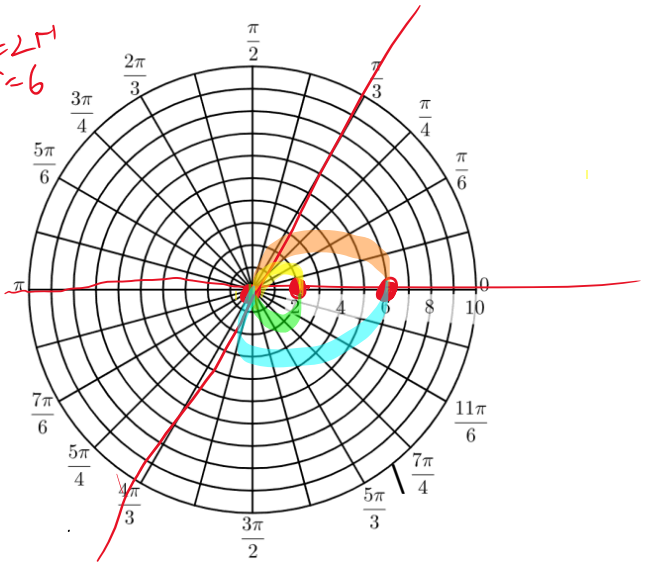
Over what interval is r…
Positive and increasing?

Positive and decreasing?

Negative and increasing?

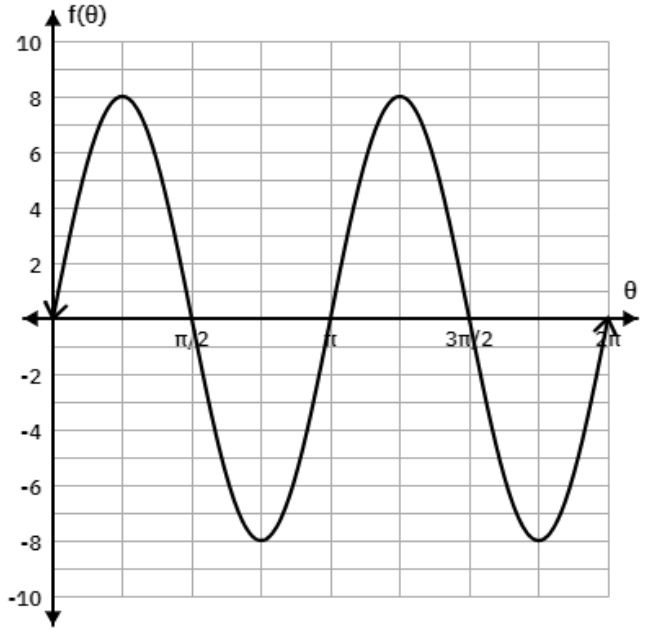
Negative and decreasing?

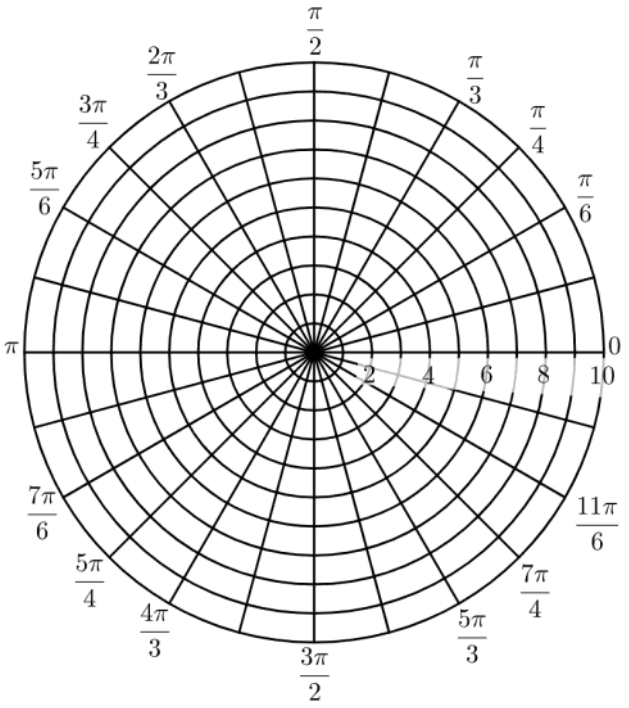




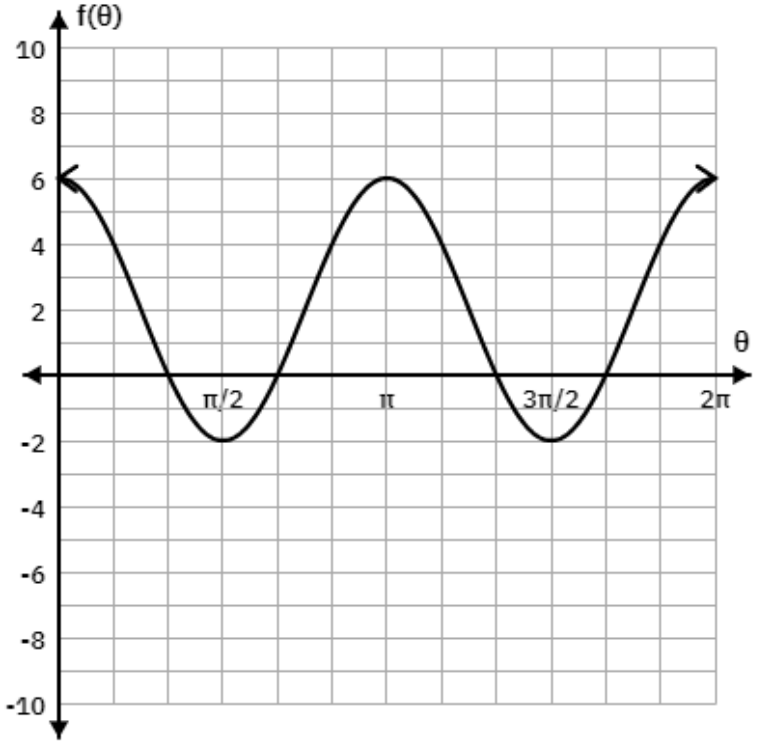
On the inteval $\frac{2\pi}{3} \leq \theta \leq \pi$ is the distance between the polar graph and the origin increasing or decreasing?

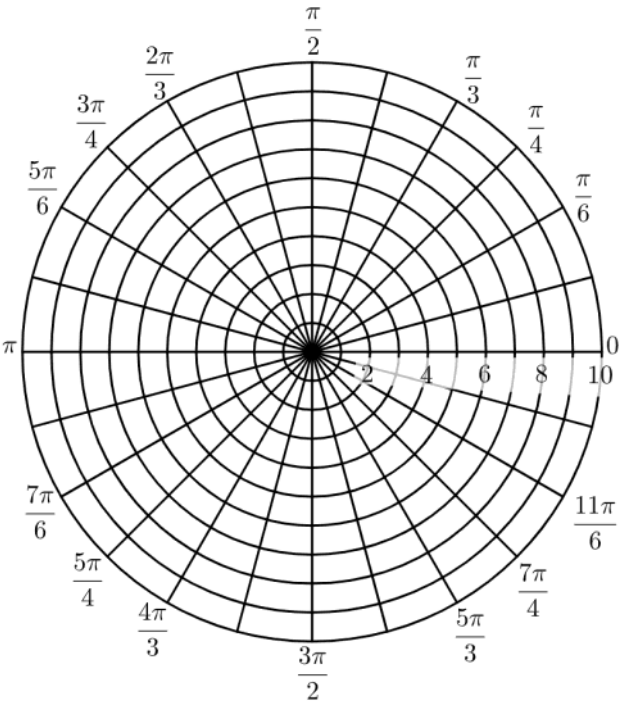
Consider $f(\theta) = 8\sin(2\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.



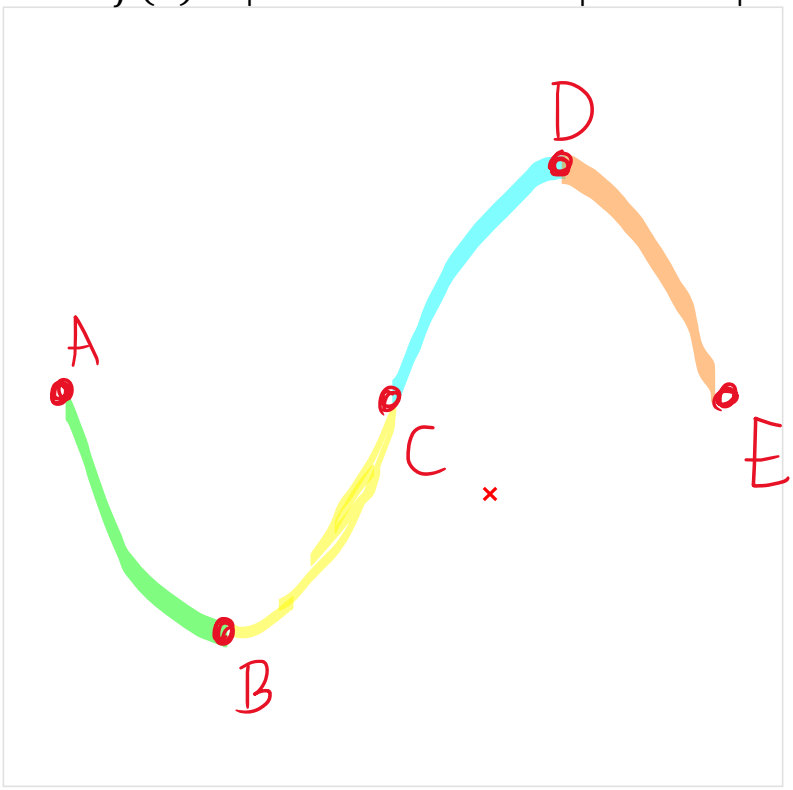


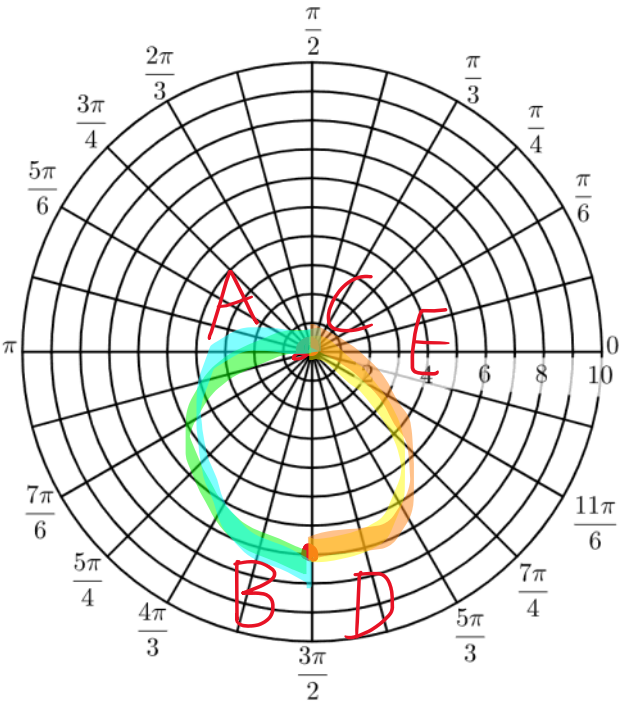
Consider $f(\theta) = 2 + 4\cos(2\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.



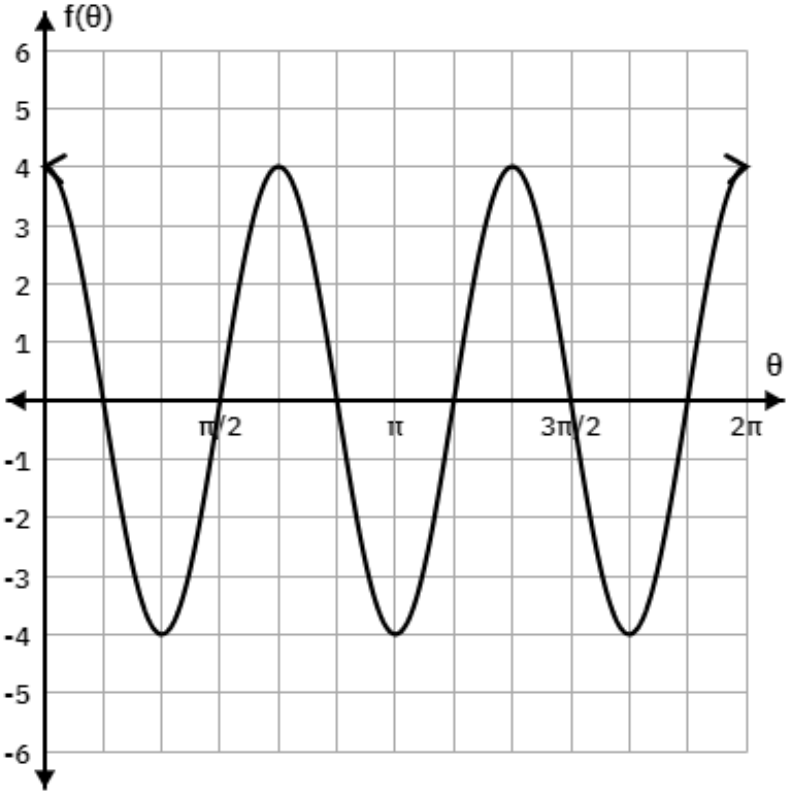


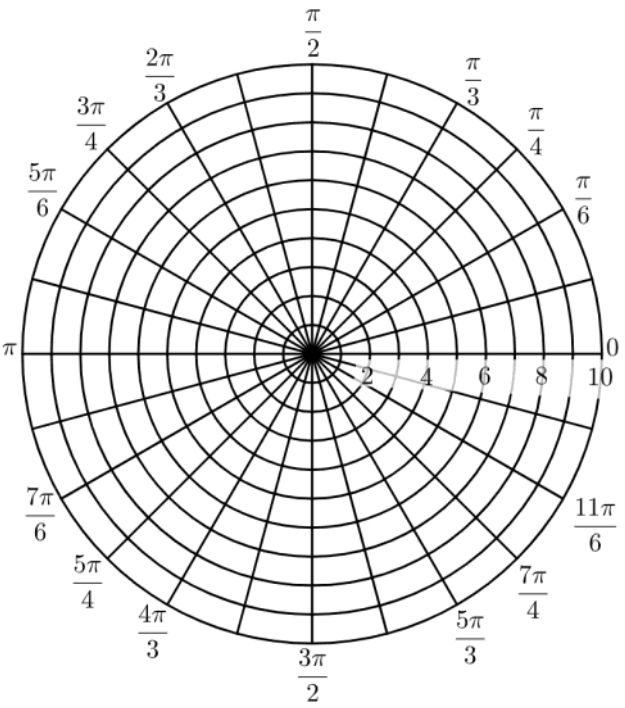
Consider $f(\theta) = -7\sin(\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.



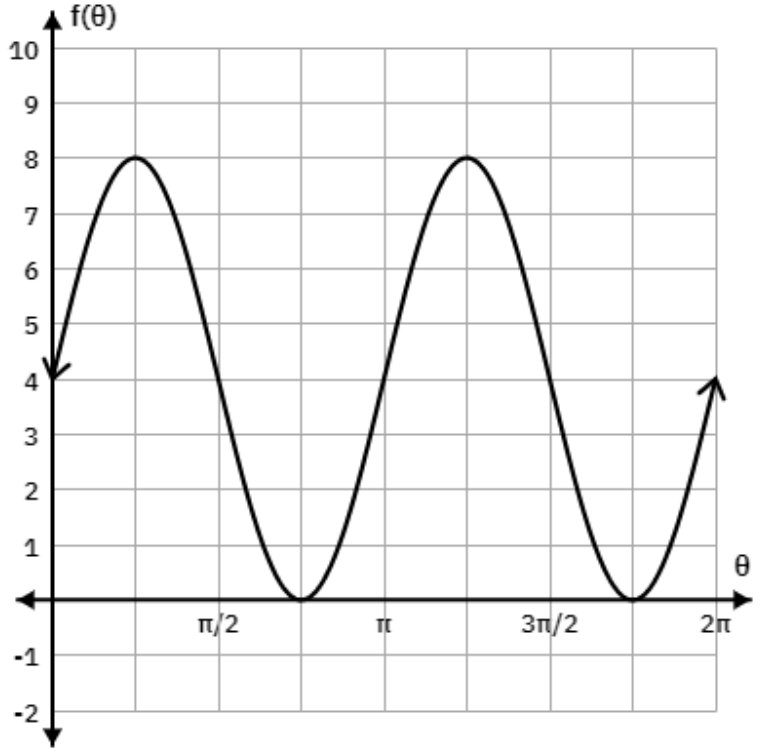


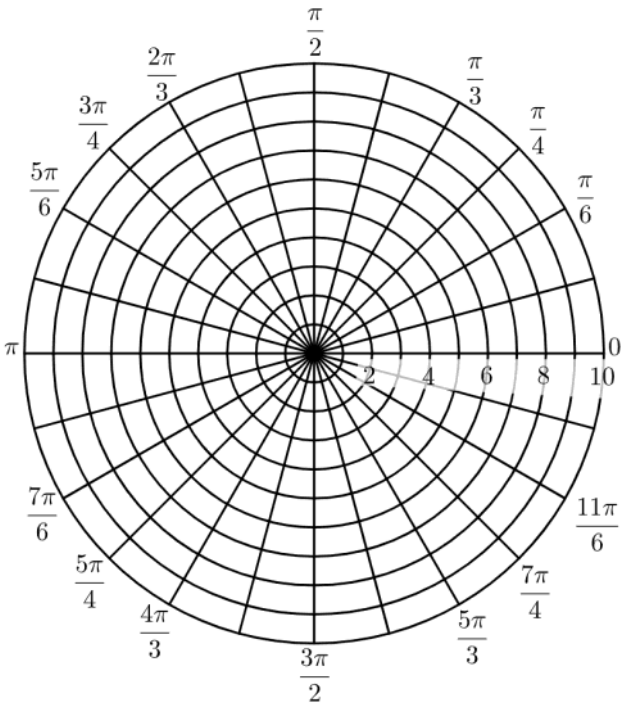
Consider $f(\theta) = 4\cos(3\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.



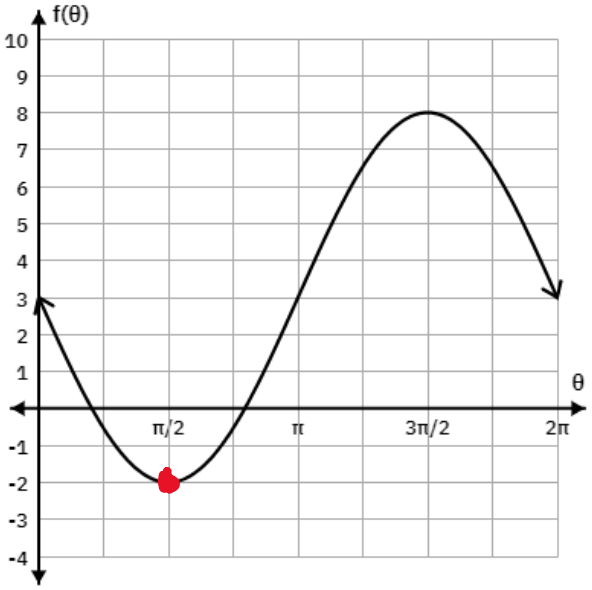


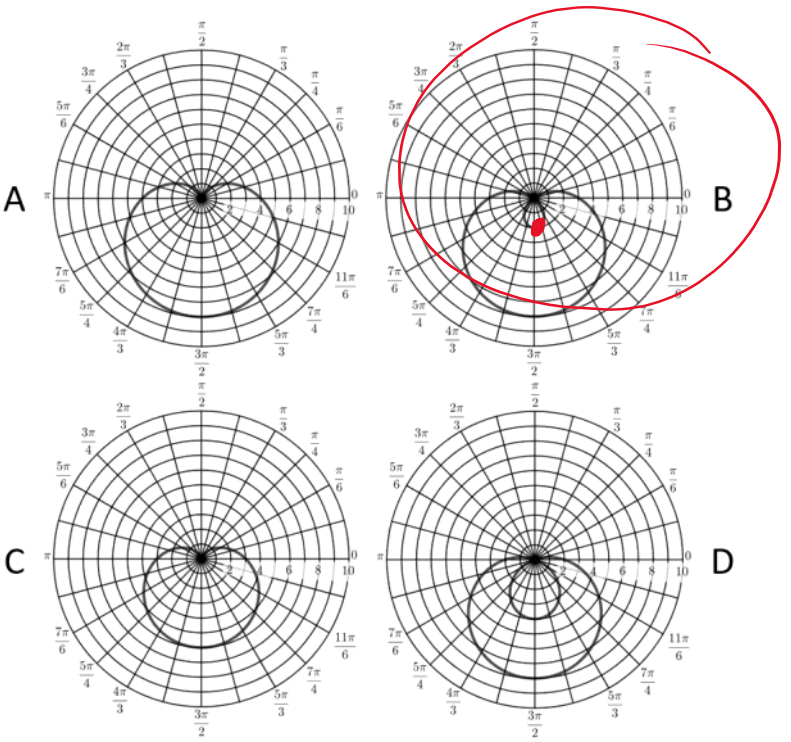
Consider $f(\theta) = 4 + 4\sin(2\theta)$. Let's analyze where the relationship is positive vs negative and increasing vs decreasing in order to graph $r = f(\theta)$ in polar. Guess the shape of the polar graph.



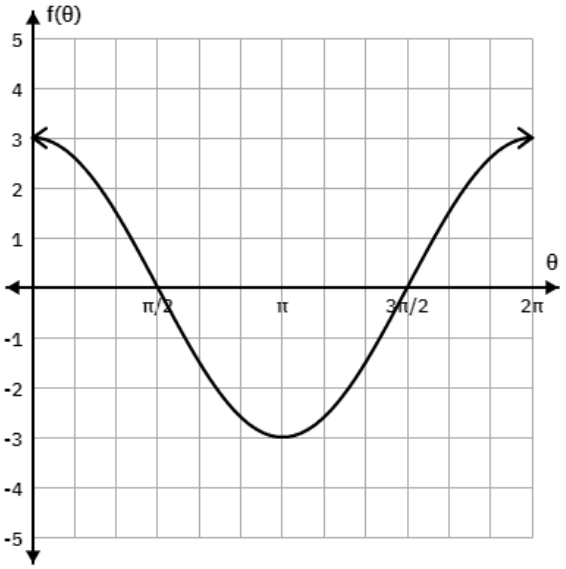


On the left is the rectangular graph of the function $f(\theta) = 3 - 5\sin(\theta)$. Which graph on the right is the graph of the polar function $r = f(\theta)$?





A polar function is given by $r = f(\theta) = 3\cos(\theta)$. A rectangular graph of $f(\theta)$ is given below. As θ increases on the interval $\frac{\pi}{2} < \theta < \pi$, which of the following is true about the points on the polar graph of $r = f(\theta)$ in the xy-plane?



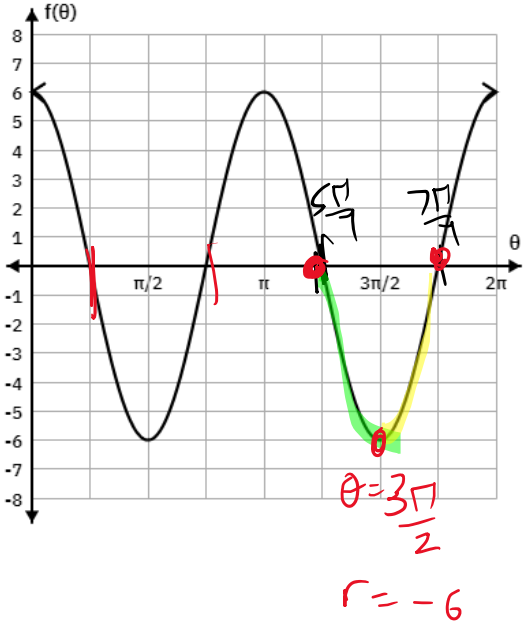
(A) The points on the polar graph are above the x-axis and are getting closer to the origin.

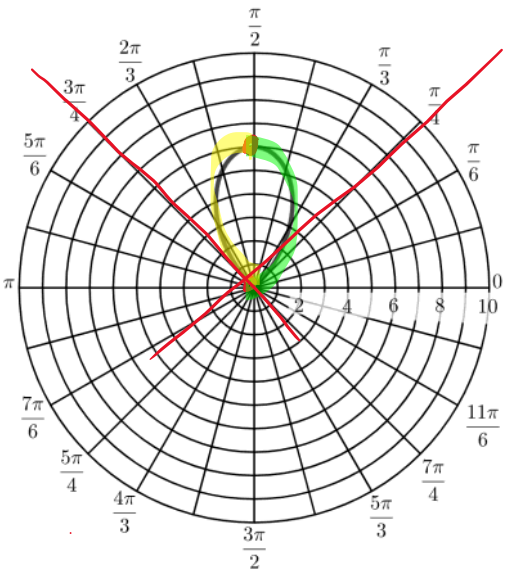
(B) The points on the polar graph are below the x-axis and are getting farther from the origin.

(C) The points on the polar graph are below the x-axis and are getting closer to the origin.

(D) The points on the polar graph are above the x-axis and are getting farther from the origin.

The rectangular graph of $f(\theta) = 6\cos(2\theta)$ is given on the left. In the middle is the polar graph $r = f(\theta)$ for $a \le \theta \le b$. Which of the following could be the values of a and b?





(A) $a = \frac{\pi}{4}$ and $b = \frac{3\pi}{4}$

(B) $a = 0$ and $b = \pi$

(C) $a = \frac{5\pi}{4}$ and $b = \frac{7\pi}{4}$

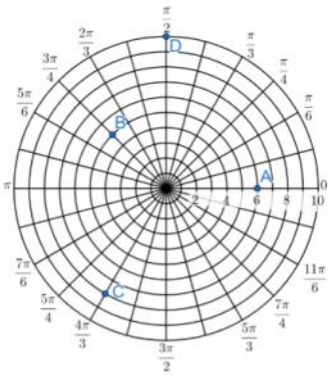
(D) $a = \pi$ and $b = 2\pi$

Day 5 Polar Coordinates

Day 5
Polar Co...

Polar Coordinates (3.13) Homework

1. Express the location of each of the points graphed to the right in polar coordinates. For each point, give two different forms of expressing the location of the point in polar coordinates.



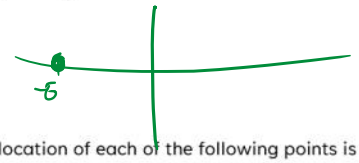
The location of each of the following points is given in polar coordinates. For each point, convert the location to rectangular coordinates.

2. $\left(4,\frac{\pi}{6}\right)$

3. $\left(10,-\frac{2\pi}{3}\right)$

4. $\left(-2,\frac{3\pi}{4}\right)$

5. $\left(-5,-\frac{\pi}{2}\right)$



The location of each of the following points is given in rectangular coordinates. For each point, convert the location to polar coordinates.

6. $(-6,0)$ → $(6,\pi)$

7. $(3,-3)$

8. $(-2,2\sqrt{3})$

9. $(0,-5)$

$r=\sqrt{x^2+y^2}$

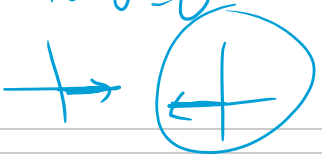
$r=\sqrt{(-6)^2+(0)^2}$

$r=\sqrt{36+0}=6$

$\tan\theta=\frac{y}{x}$

$\tan\theta=\frac{0}{-6}$

$\tan\theta=0$



In each question, three of the four given polar coordinate pairs are different representations of the same point. One of the polar coordinate pairs does not correspond to the same point as the others. Determine which does not belong in each set.

(r,θ)

In each question, three of the four given polar coordinate pairs are different representations of the same point. One of the polar coordinate pairs does not correspond to the same point as the others. Determine which does not belong in each set.

10.	$\left(-4,-\frac{\pi}{6}\right)$	$\left(4,\frac{7\pi}{6}\right)$	$\left(4,\frac{5\pi}{6}\right)$	$\left(-4,\frac{11\pi}{6}\right)$
11.	$\left(-1,-\frac{3\pi}{2}\right)$	$\left(-1,\frac{\pi}{2}\right)$	$\left(1,\frac{3\pi}{2}\right)$	$\left(1,\frac{5\pi}{2}\right)$
12.	$\left(-6,\frac{9\pi}{4}\right)$	$\left(6,\frac{\pi}{4}\right)$	$\left(6,-\frac{3\pi}{4}\right)$	$\left(6,\frac{5\pi}{4}\right)$
13.	$\left(-5,\frac{\pi}{3}\right)$	$\left(5,\frac{5\pi}{3}\right)$	$\left(-5,\frac{2\pi}{3}\right)$	$\left(5,-\frac{\pi}{3}\right)$

14. A complex number is represented by the point in the complex plane with rectangular coordinates $(\sqrt{3},1)$. Which one of the following is one way to represent this complex number using polar coordintates?

(A) $\left(\sqrt{3}\cos\left(\frac{\pi}{6}\right)\right)+i\left(\sqrt{3}\sin\left(\frac{\pi}{6}\right)\right)$

(B) $\left(\sqrt{3}\cos\left(-\frac{\pi}{6}\right)\right)+i\left(\sqrt{3}\sin\left(-\frac{\pi}{6}\right)\right)$

(C) $\left(2\cos\left(\frac{\pi}{6}\right)\right)+i\left(2\sin\left(\frac{\pi}{6}\right)\right)$

(D) $\left(2\cos\left(-\frac{\pi}{6}\right)\right)+i\left(2\sin\left(-\frac{\pi}{6}\right)\right)$

15. Which one of the following is the rectangular representation of the location of the point in the complex plane corresponding with $\left(4\cos\left(\frac{2\pi}{3}\right)\right)+i\left(4\sin\left(\frac{2\pi}{3}\right)\right)$

(A) $(-2,2\sqrt{3})$

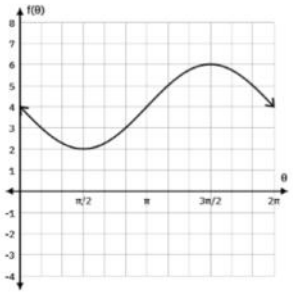
(B) $(-2\sqrt{3},2)$

(C) $(2,-2\sqrt{3})$

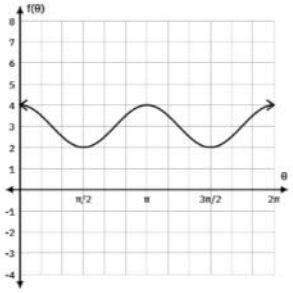
(D) $(2\sqrt{3},-2)$

Each numbered graph on the left is a rectangular graph of a relationship between θ and $f(\theta)$. On the right are polar representations of these relationships. Match the number of each rectangular graph with the letter of the corresponding polar graph.

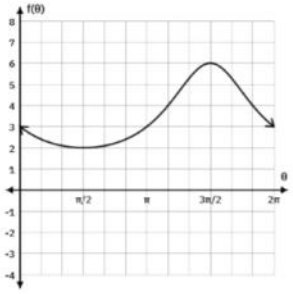
16.



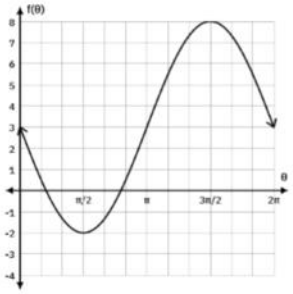
17.



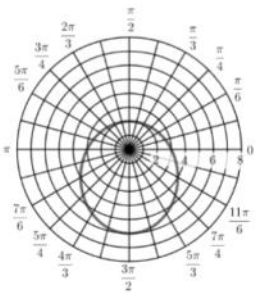
18.



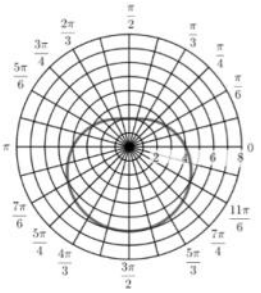
19.



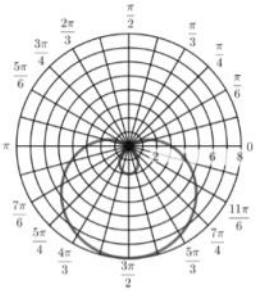
(A)



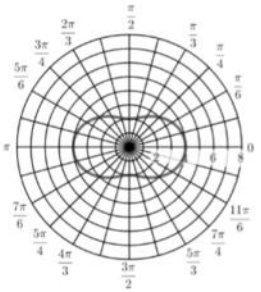
(B)



(C)



(D)



CBHS AP Precalculus 2024/25 – Advanced Trig, Day 5 HW

Polar Coordinates HW Answers

1. $A = (-6, -\pi) = (6,0) = (-6, \pi) = (6,2\pi) = (-6,3\pi)$
   $B = \left(-5, -\frac{\pi}{4}\right) = \left(5, \frac{3\pi}{4}\right) = \left(-5, \frac{7\pi}{4}\right) = \left(5, \frac{11\pi}{4}\right) = \left(-5, \frac{15\pi}{4}\right)$
   $C = \left(8, -\frac{2\pi}{3}\right) = \left(-8, \frac{\pi}{3}\right) = \left(8, \frac{4\pi}{3}\right) = \left(-8, \frac{7\pi}{3}\right) = \left(8, \frac{10\pi}{3}\right)$
   $D = \left(-10, -\frac{\pi}{2}\right) = \left(10, \frac{\pi}{2}\right) = \left(-10, \frac{3\pi}{2}\right) = \left(10, \frac{5\pi}{2}\right) = \left(-10, \frac{7\pi}{2}\right)$
2. $\left(2\sqrt{3}, 2\right)$
3. $\left(-5, -5\sqrt{3}\right)$
4. $\left(\sqrt{2}, -\sqrt{2}\right)$
5. $(0,5)$

For questions #6-9, there are many ways to answer correctly. If you are unsure if your answer is correct, just ask.

6. $(6, \pi)$
7. $\left(3\sqrt{2}, \frac{7\pi}{4}\right)$
8. $\left(4, \frac{2\pi}{3}\right)$
9. $\left(5, \frac{3\pi}{2}\right)$
10. $\left(4, \frac{7\pi}{6}\right)$
11. $\left(1, \frac{5\pi}{2}\right)$
12. $\left(6, \frac{\pi}{4}\right)$
13. $\left(-5, \frac{\pi}{3}\right)$
14. (C) $\left(2\cos\left(\frac{\pi}{6}\right)\right) + i\left(2\sin\left(\frac{\pi}{6}\right)\right)$
15. (A) $\left(-2, 2\sqrt{3}\right)$
16. (B)
17. (D)
18. (A)
19. (C)