

PARAMETRICS AND POLAR TEST

Parametric Equations

Name _____

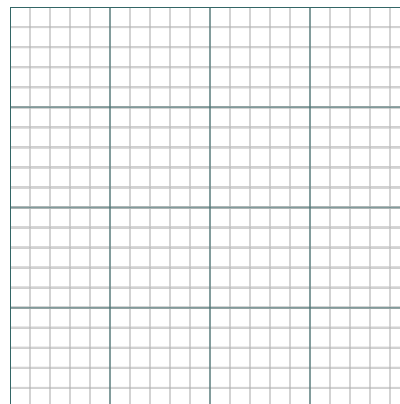
1. Eliminate the parameter and find a rectangular equation for the following parametric equations. Show all work.

A) [3pts] $x = t^3$ and $y = 1 - t$

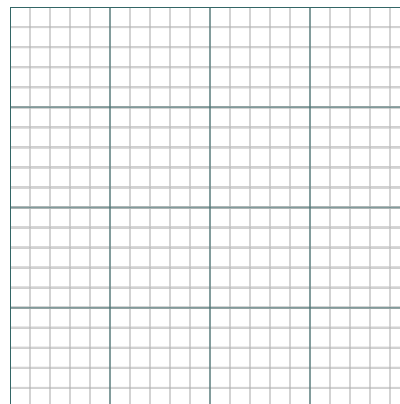
B) [3pts] $x = 4 \sin t$ and $y = 3 \cos t$

2. Graph the curve whose parametric equations are given, indicating the orientation of the curve with arrows. Clearly label the axes on your graph paper before graphing.

A) [3pts] $x = t + 5$ and $y = (t - 1)^2$ where $-2 \leq t \leq 2$



B) [3pts] $x(t) = 4 \cos(t)$ and $y(t) = 4 \sin(t)$ where $0 \leq t < 2\pi$



Polar Equations

1. [2pts] Convert $(5, -5)$ to polar coordinates with $0 \leq \theta < 2\pi$ _____

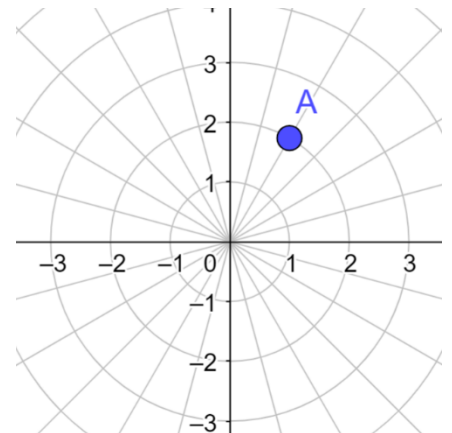
2. [2pts] Convert $(6, 2\sqrt{3})$ to polar coordinates with $0 \leq \theta < 2\pi$ _____

3. [2pts] Convert $(6, 2\pi/3)$ to rectangular coordinates _____

4. [2pts] Convert $(5, 3\pi/2)$ to rectangular coordinates _____

5. [2pts] Which of the following is **not** a possible coordinate for point A?

- A) $(2, \pi/3)$
- B) $(-2, 4\pi/3)$
- C) $(2, 13\pi/3)$
- D) $(-2, -\pi/3)$
- E) $(-2, -8\pi/3)$



6. [2pts] Which of the following *polar coordinate* points is furthest from the origin?

- A) $(-\pi, 4)$
- B) $(-3, \pi/2)$
- C) $(2, 3\pi)$
- D) $(1, 6\pi)$
- E) $(2, 35)$

7. [2pts] Convert to polar: $x^2 - y^2 = 16$

A) $r = \frac{4}{\cos\theta - \sin\theta}$

B) $r^2 = \frac{16}{\cos^2\theta - \sin^2\theta}$

C) $r = \frac{16}{\sin\theta \cos\theta}$

D) $r = \frac{16}{\sin\theta - \cos\theta}$

E) $r = \frac{4}{\sin\theta - \cos\theta}$

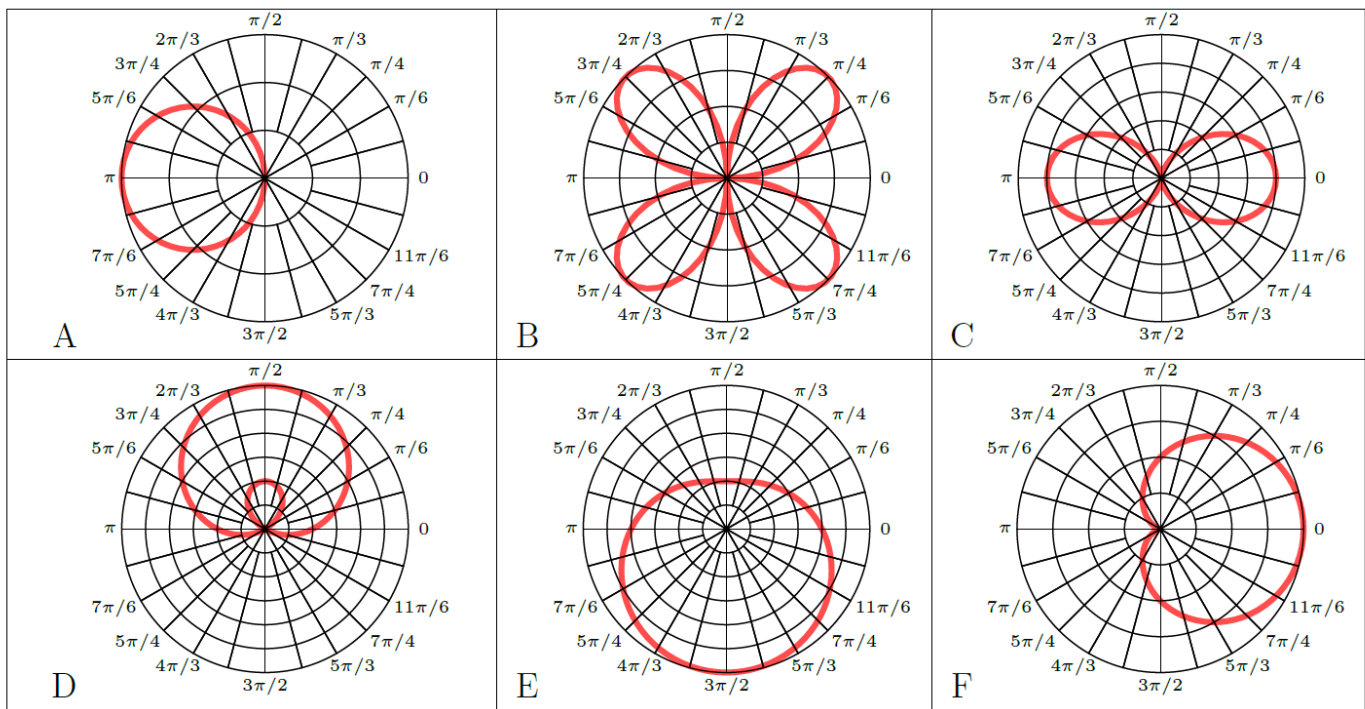
8. [2pts] Convert to rectangular: $r = \cos(\theta)$

- A) $x^2 + y^2 = x$
- B) $y = x^2 - y^2$
- C) $\sqrt{x + y} = y$
- D) $xy = 1 - y^2$
- E) $x^2 + y^2 = y$

9. [2pts] Convert to rectangular $r = \sec(\theta)$

- A) $y = 1$
- B) $xy = 1$
- C) $y = x$
- D) $x = 1$
- E) $y = -x$

Questions 10-12 Refer to the graphs below. The scale in the “r” axis is 1 unit per circle.



10. [1pt] Which of the above (A-F) is the graph of $r = 4 \sin(2\theta)$? _____

11. [1pt] Which of the above (A-F) is the graph of $r = -3 \cos(\theta)$? _____

12. [1pt] Which of the above (A-F) is the graph of $r = 2 + 2 \cos(\theta)$? _____

True/False

1. _____ [1pt] It is possible for a single point in the plane to have the same coordinates in both rectangular and polar representations.
2. _____ [1pt] A function $y = f(x)$ cannot intersect itself
3. _____ [1pt] In a polar graph, the value of r is always non-negative.
4. _____ [1pt] Arrows on a parametric graph indicate the direction of increasing y values.
5. _____ [1pt] Every point in the plane has infinitely many polar coordinate representations.

Free Response

A baseball pitcher throws a baseball with an initial speed of 138 feet per second at an angle of 20° to the horizontal. At time $t = 0$, the ball leaves the pitcher's hand at a height of 4 feet above the ground.

1. [1pt] Find four parametric equations that describe the position and velocity of the ball as a function of time. (Assume the ground has a y -coordinate of 0).
2. [1pt] Set up but do not solve an equation to answer: How long is the ball in the air?
3. [1pt] Set up but do not solve an equation to answer: At what time does the ball reach its maximum height?
4. [1pt] What is the height of the ball after 2 seconds?
5. [1pt] Does the ball fly for more than 4 seconds?