Parametrics and Polar Test

DRAFT / QUESTION BANK

Parametric Equations

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] $y = 4\sin t$ and $y = 3\cos t$

2. Graph the curve whose parametric equations are given, indicating the orientation of the curve with arrows.

   A) [3pts] $x = t + 5$ and $y = (t-1)^2$ where $-2 \le t \le 2$
   B) [3pts] $x(t) = 4\cos t$ and $y(t) = 4\sin t$

Polar Coordinates

(some of these are designed as MC questions)

2. [2pts] Convert $(5, -5)$ to polar coordinates with $0 \le \theta < 2\pi$
3. [2pts] Convert $(2, 6\sqrt{3})$ to polar coordinates with $0 \le \theta < 2\pi$
4. [2pts] Convert $(6, 2\pi/3)$ to rectangular coordinates
5. [2pts] Convert $(5, 3\pi/2)$ to rectangular coordinates
6. [2pts] Which of the following is not a possible coordinate for the indicated point.

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

7. [2pts] Which of the following *polar coordinate* points is furthest from the origin?

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

8. [2pts] Convert to polar: $x^2 - y^2 = 16$

   A) $r^2 = \dfrac{16}{\cos^2\theta - \sin^2\theta}$

B) $r = \dfrac{4}{\cos\theta - \sin\theta}$
C) $r = \dfrac{16}{\sin\theta\cos\theta}$
D) $r = \dfrac{16}{\sin\theta - \cos\theta}$
E) $r = \dfrac{4}{\sin\theta - \cos\theta}$

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

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

10. [2pts] Convert to rectangular $r = \sec(\theta)$

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A)  $x=1$
B)  $y=1$
C)  $xy = 1$
D)  $y = x$
E)  $y = -x$
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11. [2pts] Which of the following is the graph of $r = \cos(2\theta)$?
12. [2pts] Which of the following is the graph of $r = 4\sin(\theta)$?
13. [2pts] What is the maximum value for r in the function $r = 2 + 4\sin\theta$? A) 6 B) 5 C) 4 D) 3 E) 2

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] The graph of a parametric system cannot intersect itself.
4. [1pt] Graphs of polar functions never fail the vertical line test.
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. 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 5 seconds?
5. [1pt] Does the ball fly for more than 8 seconds?