

Graph And Find Area Of Polar Equations Worksheet Questions and Answers PDF

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Part 1: Building a Foundation

What is the formula to convert a point from polar coordinates (r, θ) to Cartesian coordinates?

Hint: Consider the definitions of x and y in terms of r and θ .

- A) $x = r \sin(\theta)$, $y = r \cos(\theta)$
- B) $x = r \cos(\theta)$, $y = r \sin(\theta)$ ✓
- C) $x = r \tan(\theta)$, $y = r \cot(\theta)$
- D) $x = r \sec(\theta)$, $y = r \csc(\theta)$

■ The correct formula is $x = r \cos(\theta)$, $y = r \sin(\theta)$.

Which of the following are true about polar coordinates?

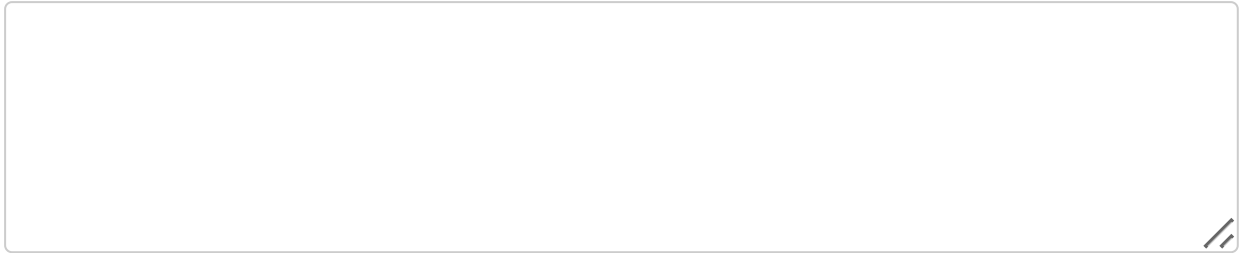
Hint: Think about the definitions and properties of polar coordinates.

- A) The origin is represented as $(0, \theta)$ for any θ . ✓
- B) The angle θ is measured from the positive x -axis. ✓
- C) Polar coordinates can only represent points in the first quadrant.
- D) r can be negative, indicating the point is in the opposite direction of θ . ✓

■ The true statements are A, B, and D.

Explain the relationship between polar and Cartesian coordinates. How do they differ in representing points on a plane?

Hint: Consider how each system defines a point in space.



Polar coordinates use a radius and angle, while Cartesian coordinates use x and y values.

Part 2: Understanding and Interpretation

Which of the following polar equations represents a circle?

Hint: Consider the standard form of a circle in polar coordinates.

- A) $r = 2 + 3\cos(\theta)$
- B) $r = 4$ ✓
- C) $r = 3\sin(2\theta)$
- D) $r = \theta$

The equation $r = 4$ represents a circle with radius 4.

Identify the symmetries present in the polar equation $r = 5\cos(\theta)$.

Hint: Think about how the graph behaves with respect to the axes and origin.

- A) **Symmetry about the polar axis** ✓
- B) Symmetry about the line $\theta = \pi/2$
- C) **Symmetry about the pole** ✓
- D) No symmetry

The equation has symmetry about the polar axis and the pole.

Describe how you would determine the symmetry of a polar graph. What tests would you perform?

Hint: Consider the properties of polar equations and their graphs.

To determine symmetry, check if the equation remains unchanged under specific transformations.

Part 3: Application and Analysis

If a polar equation is given by $r = 3 + 2\sin(\theta)$, what is the maximum value of r ?

Hint: Consider the range of the sine function.

- A) 2
- B) 3
- C) 5 ✓
- D) 1

The maximum value of r is 5 when $\sin(\theta)$ is at its maximum.

Consider the polar equation $r = 2\sin(\theta)$. Which of the following are true about its graph?

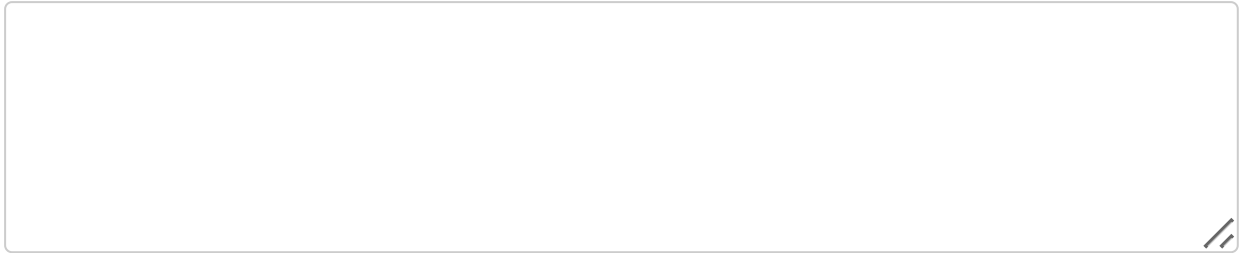
Hint: Think about the shape and properties of the graph.

- A) It is a circle. ✓
- B) It is symmetric about the line $\theta = \pi/2$. ✓
- C) The maximum radius is 2. ✓
- D) It passes through the origin.

The graph is a circle, symmetric about the line $\theta = \pi/2$, with a maximum radius of 2.

Given the polar equation $r = 4\cos(3\theta)$, determine the number of petals in the graph and explain your reasoning.

Hint: Consider the properties of rose curves.



The graph has 6 petals because the coefficient of θ is 3, which indicates $2n$ petals for n being odd.

Which integral would you use to find the area enclosed by one petal of the polar equation $r = 3\cos(2\theta)$?

Hint: Think about the formula for area in polar coordinates.

- A) $\frac{1}{2} \int_{0}^{\pi} (3\cos(2\theta))^2 d\theta$
- B) $\frac{1}{2} \int_{0}^{\pi/2} (3\cos(2\theta))^2 d\theta$ ✓
- C) $\frac{1}{2} \int_{0}^{\pi/4} (3\cos(2\theta))^2 d\theta$
- D) $\frac{1}{2} \int_{0}^{\pi/3} (3\cos(2\theta))^2 d\theta$

The correct integral is $\frac{1}{2} \int_{0}^{\pi/2} (3\cos(2\theta))^2 d\theta$.

Part 4: Evaluation and Creation

Evaluate the accuracy of the following statement: "The area enclosed by the polar curve $r = 2\sin(\theta)$ from $\theta = 0$ to $\theta = \pi$ is π ." Is this statement:

Hint: Consider the area calculation for polar curves.

- A) True ✓
- B) False
- C) Uncertain
- D) Not applicable

The statement is true; the area is indeed π .

Create a polar equation that represents a rose curve with 6 petals. Which of the following equations would work?

Hint: Consider the relationship between the number of petals and the coefficient in the equation.

- A) $r = 4\cos(3\theta)$
- B) $r = 2\sin(3\theta)$
- C) $r = 5\cos(6\theta)$ ✓
- D) $r = 3\sin(6\theta)$ ✓

■ The equations $r = 5\cos(6\theta)$ and $r = 3\sin(6\theta)$ both represent rose curves with 6 petals.

Design a real-world scenario where polar coordinates would be more advantageous than Cartesian coordinates. Explain why polar coordinates are preferable in this context.

Hint: Think about situations involving angles and distances.

■ **Polar coordinates are preferable in scenarios like navigation or radar, where direction and distance are key.**