

# Polar Coordinates and Polar Graphs

Polar representation, polar graphs, and translation between polar and rectangular viewpoints.

Name \_\_\_\_\_ Date \_\_\_\_\_

32 main 2-up grid 2 pages

## Completion Reward



Shown here as a small pack artifact, not a preview destination.

1. What does a polar point  $(r, \theta)$  describe?

- A. An x-value and y-value
- B. A distance from the pole and an angle from the polar axis
- C. A slope and intercept
- D. A length and an area

4. Which equations convert polar coordinates to rectangular coordinates?

- A.  $x = r \sin(\theta)$ ,  $y = r \cos(\theta)$
- B.  $x = r \cos(\theta)$ ,  $y = r \sin(\theta)$
- C.  $x = \cos(r)$ ,  $y = \sin(\theta)$
- D.  $x = r + \theta$ ,  $y = r - \theta$

7. What kind of graph is  $\theta = \pi / 6$ ?

- A. A circle of radius  $\pi / 6$
- B. A vertical line
- C. A ray from the pole at angle  $\pi / 6$
- D. A rose curve

10. To convert a rectangular point to polar form, what do you usually find first?

- A. The slope-intercept form
- B.  $r$  from  $x^2 + y^2$
- C. The tangent line at the point
- D. The x-coordinate only

13. A student says  $(3, \pi / 4)$  and  $(-3, \pi / 4)$  are the same point. What is wrong?

- A. A negative radius points in the opposite direction
- B. Negative radii are not allowed
- C. The angle should be doubled
- D. The radius should be squared

16. Find  $x$  if  $(r, \theta) = (6, \pi / 3)$ . Answer with a number.

19. For the point  $(\sqrt{3}, 1)$ , find a principal angle  $\theta$  with  $0 \leq \theta < 2\pi$ . Answer as an exact value.

22. For  $r = 3 + 3\sin(\theta)$ , find  $r$  when  $\theta = \pi / 2$ . Answer with a number.

2. Which angle names the same direction as  $\theta = \pi / 3$ ?

- A.  $2\pi / 3$
- B.  $\pi / 6$
- C.  $7\pi / 3$
- D.  $-\pi / 6$

5. Which equation is always true in polar coordinates?

- A.  $r = x + y$
- B.  $\theta = x^2 + y^2$
- C.  $r^2 = x^2 + y^2$
- D.  $x = y / r$

8. Which type of graph commonly has petals?

- A. A constant-radius circle
- B. A ray
- C. A linear function
- D. A rose curve like  $r = 3\cos(2\theta)$

11. What is the best way to start understanding the graph of  $r = 2 + 2\cos(\theta)$ ?

- A. Convert immediately to slope-intercept form
- B. Sample key angles and look for symmetry
- C. Assume it is a line because of the plus sign
- D. Differentiate it before graphing

14. Convert  $(3, 4)$  to polar form. What is  $r$ ? Answer with a number.

17. Find  $y$  if  $(r, \theta) = (6, \pi / 3)$ . Answer as an exact value.

20. For the point  $(-1, \sqrt{3})$ , find a principal angle  $\theta$  with  $0 \leq \theta < 2\pi$ . Answer as an exact value.

23. For  $r = 2 + 2\cos(\theta)$ , what is  $r$  when  $\theta = \pi$ ? Answer with a number.

3. What does a negative radius do in polar coordinates?

- A. It points in the opposite direction of the angle
- B. It reflects the point across the polar axis only
- C. It makes the point undefined
- D. It changes the angle by  $\pi / 2$

6. What kind of graph is  $r = 4$ ?

- A. A line through the origin
- B. A spiral
- C. A parabola
- D. A circle centered at the pole with radius 4

9. Which equation is a cardioid-type graph?

- A.  $r = 4$
- B.  $\theta = \pi / 3$
- C.  $r = \theta$
- D.  $r = 2 + 2\cos(\theta)$

12. A student converts  $(r, \theta)$  to  $x = r \sin(\theta)$ ,  $y = r \cos(\theta)$ . What is the mistake?

- A. They swapped the cosine and sine roles for  $x$  and  $y$
- B. They forgot to square  $r$
- C. They should use tangent only
- D. Nothing is wrong

15. Convert  $(-5, 12)$  to polar form. What is  $r$ ? Answer with a number.

18. For the point  $(1, \sqrt{3})$ , find  $r$ . Answer with a number.

21. For  $r = 4\cos(\theta)$ , find  $r$  when  $\theta = \pi / 3$ . Answer with a number.

24. Find  $x$  if  $(r, \theta) = (8, \pi / 4)$ . Answer as an exact value.

25. Find  $y$  if  $(r, \theta) = (8, \pi / 4)$ . Answer as an exact value.

26. Write  $x$  in terms of  $r$  and  $\theta$ . Answer as an equation.

27. Write  $y$  in terms of  $r$  and  $\theta$ . Answer as an equation.

28. Write the relationship between  $r$ ,  $x$ , and  $y$ . Answer as an equation.

29. Write a positive-radius point equivalent to  $(-4, \pi / 3)$ . Answer as an equation.

30. Write the rectangular point equivalent to  $(2, \pi / 2)$ . Answer as an ordered pair.

31. Write the rectangular point equivalent to  $(2, \pi)$ . Answer as an ordered pair.

32. Which point names the same location as  $(-2, \pi / 6)$ ?

- A.  $(2, 7\pi / 6)$
- B.  $(2, \pi / 6)$
- C.  $(2, 5\pi / 6)$
- D.  $(-2, 7\pi / 6)$