LESSON MAKER PRO

Polar Switch Lab

Rewrite equations between rectangular and polar forms.

HIGH SCHOOL · MA.912.T.4.2

MA.912.T.4.2 "Represent equations given in rectangular coordinates in terms of polar coordinates. Represent equations given in polar coordinates in terms of rectangular coordinates."

NAME _____ DATE _____

SWITCHING COORDINATE FORMS

To change a rectangular equation to polar form, use x=r cos(theta), y=r sin(theta), and $x^2+y^2=r^2$. To change a polar equation to rectangular form, replace r cos(theta) with x and r sin(theta) with y.

WORKED EXAMPLE

Convert $x^2+y^2=10x$ to polar form.

1. Replace x^2+y^2 with r^2 and x with r cos(theta): $r^2=10r\cos(\theta)$.
2. For $r \neq 0$, divide by r: $r = 10\cos(\theta)$. Check the excluded case separately: the origin is on the original circle and is represented by r = 0, theta = 90° in this polar equation.

Answer: r=10cos(theta)

PRACTICE 6 problems

1 Convert $x^2+y^2=6y$ to polar form.

ANSWER _____

2 Convert x=-5 to polar form.

ANSWER _____

3 Convert r=8 to rectangular form.

ANSWER _____

4 Convert r=4cos(theta) to rectangular form.

ANSWER _____

5 Convert r=3sin(theta) to rectangular form.

ANSWER _____

6 Convert r cos(theta)+2r sin(theta)=7 to rectangular form.

ANSWER _____

APPLY IT Show your work

1 A drone films a skateboard competition while following a path modeled by $x^2+y^2=12x$, where the origin is the center of the park. Write the path in polar form.

WORK SPACE

ANSWER

2 At an esports event, a motion-tracking zone includes every point 9 feet from the tracking hub. The zone is modeled by r=9. Write the boundary in rectangular form.

WORK SPACE

ANSWER

CHALLENGE One step up

Convert r=5/(2cos(theta)-sin(theta)) to rectangular form.

WORK SPACE AND ANSWER

ANSWER KEY # Polar Switch Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Convert $x^2+y^2=6y$ to polar form.	**r=6sin(theta)**
2	Convert x=-5 to polar form.	**r cos(theta)=-5**
3	Convert r=8 to rectangular form.	**$x^2+y^2=64$**
4	Convert r=4cos(theta) to rectangular form.	**$x^2+y^2=4x$**
5	Convert r=3sin(theta) to rectangular form.	**$x^2+y^2=3y$**
6	Convert r cos(theta)+2r sin(theta)=7 to rectangular form.	**x+2y=7**

PART 2 · APPLY IT

1. **r=12cos(theta)** Substitute to obtain $r^2 = 12r\cos(\theta)$. For $r \neq 0$, divide by r. The excluded origin is on the original circle and is still represented by r = 0 at theta = 90°, so r = 12cos(theta) represents the full circle.
2. **$x^2+y^2=81$** Square both sides to get $r^2=81$. Replace r^2 with x^2+y^2.

CHALLENGE

2x-y=5

Accept equivalent forms, such as r=-5sec(theta) for problem 2. For equations involving r, accept algebraically equivalent forms with appropriate domain restrictions.