

Polar Coordinates

Would you like to know more about polar coordinates? Plotting and finding the distance between two polar points? Maybe how to convert polar coordinates to rectangular coordinates and vice versa? We have 6 new eActivities to assist you in your explorations of polar coordinates.

This file includes eActivities on:

1. **Plotting Point** You can find the points on the graph with your polar coordinates.
2. **Conversion** Discover the way to convert the coordinate between Polar and Rectangular.
3. **Circle 1** Draw and convert the polar equation to the circle.
4. **Circle 2** Convert the equation from rectangular coordinates to polar coordinates.
5. **Distance** Find the distance of two polar coordinates.
6. **Polar Form Curves** Several different curves.

1. Plotting Point

You can find the points on the graph with your polar coordinates.

2. Conversion

Discover the way to convert the coordinate between Polar and Rectangular.

3_Circle 1

Draw and convert the polar equation to the circle.

Polar Coordinates

<Circle 1>
 $r = r_0 \cdot \cos(\theta)$

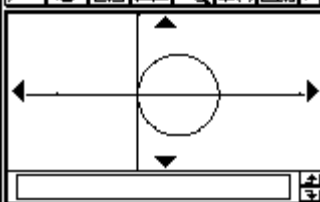
[Example-1]
 $r = \cos(\theta)$

Convert the equation. We know the relation $x = r \cdot \cos(\theta)$, $y = r \cdot \sin(\theta)$ and $r^2 = x^2 + y^2$.

Conversion-1

Then $x^2 + y^2 = x$. Open Conics and use the function "Fit into Conics Form".

Edit Zoom Analysis



Conics Equation:
 $(x - \frac{1}{2})^2 + y^2 = \frac{1}{4}$

4_Circle 2

Convert the equation from rectangular coordinates to polar.

Polar Coordinates

<Circle 2>
 $r = r_1 \cdot \cos(\theta) + r_2 \cdot \sin(\theta)$

[Example]
 $(x-1)^2 + (y-2)^2 = 5$

Conversion

$(2 \cdot \cos(\theta) + 4 \cdot \sin(\theta) - r) \cdot r = 0$
 but $r \neq 0$, then
 $r = 2 \cdot \cos(\theta) + 4 \cdot \sin(\theta)$

Draw the graph.

Edit Action Interactive

$r \cdot \cos(\theta) \rightarrow x$
 $r \cdot \sin(\theta) \rightarrow y$

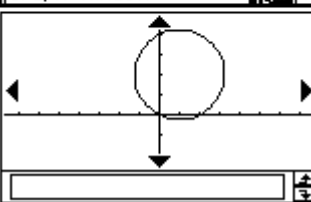
$(x-1)^2 + (y-2)^2 = 5$
 $(r \cdot \cos(\theta) - 1)^2 + (r \cdot \sin(\theta) - 2)^2 = 5$
 simplify(ans)
 $r^2 - 2 \cdot r \cdot \cos(\theta) - 4 \cdot r \cdot \sin(\theta) + 5 = 5$
 rewrite(ans)
 $r^2 - 2 \cdot r \cdot \cos(\theta) - 4 \cdot r \cdot \sin(\theta) = 0$
 factor(ans)
 $(-2 \cdot \cos(\theta) + 4 \cdot \sin(\theta) - r) \cdot r = 0$
 ans*(-1)
 $(2 \cdot \cos(\theta) + 4 \cdot \sin(\theta) - r) \cdot r = 0$

File Edit Insert Action

Conversion

$(2 \cdot \cos(\theta) + 4 \cdot \sin(\theta) - r) \cdot r = 0$
 but $r \neq 0$, then
 $r = 2 \cdot \cos(\theta) + 4 \cdot \sin(\theta)$

Draw the graph.



5_Distance

Find the distance of two polar coordinates.

Polar Coordinates

<Distance>
 $A = [5, \angle(120^\circ)]$, $B = [3, \angle(30^\circ)]$

Geometry

By the law of cosines,
 $a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos(\theta)$

Substitute the number.

Calculator (Deg)

The distance is 5.8 .

Try your own.

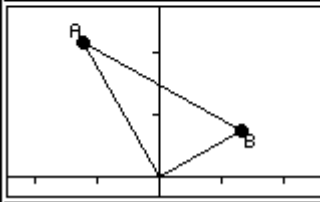
File Edit Insert Action

By the law of cosines,
 $a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos(\theta)$

Substitute the number.

Calculator (Deg)

The distance is 5.8 .



6_Polar Form Curves

Several different curves.

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Polar Form Curves

<Linear Equation>
 $r = \frac{c}{a \cdot \sin(\theta) \pm b \cdot \cos(\theta)}$
Try it!

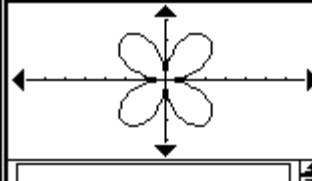
<Circle>
 $r = a \cdot \sin(\theta)$
 $r = a \cdot \cos(\theta)$

<Rose Curve>
 $r = a \cdot \sin(n\theta)$
 $r = a \cdot \cos(n\theta)$

<Limacons>

Alg Standard Cplx Rad

Edit Zoom Analysis



Sheet1 Sheet2 Sheet3

$r_1 = 3 \cdot \sin(2 \cdot \theta)$
 $r_2 = 0$
 $r_3 = 0$
 $r_4 = 0$
 $r_5 = 0$
 $r_6 = 0$
 $r_7 = 0$
 $r_8 = 0$

Rad Cplx