

9-6 Polar Coordinates

A diagram showing a point in the first quadrant of a Cartesian coordinate system. A solid line segment of length r connects the origin to the point. A dashed arc indicates the angle θ measured counter-clockwise from the positive x-axis to the line segment. Labels include (r, θ) , "distance from origin", and "direction angle".

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A Cartesian coordinate system with a point plotted in the second quadrant. A green dashed line segment of length 5 connects the origin to the point. The angle θ is measured counter-clockwise from the positive x-axis. Three sets of polar coordinates are listed: (r, θ) , $(5, 45^\circ)$, $(-5, 225^\circ)$, $(5, -315^\circ)$, and $(-5, -135^\circ)$.

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Ex 1 Plot the point in polar coordinates.
Find the corresponding rectangular coordinate.
Find another set of corresponding polar coordinates.

$(2, \frac{\pi}{3})$ $(1, 1.7)$

A Cartesian coordinate system with a point plotted in the first quadrant. A dashed line segment of length 2 connects the origin to the point. The angle θ is 60° . A right triangle is formed with the x-axis, with a horizontal leg of length 1 and a vertical leg of length 1.7. The rectangular coordinates are $(1, 1.7)$. Three other sets of polar coordinates are listed: $(-2, 240^\circ)$, $(-2, -120^\circ)$, and $(2, -300^\circ)$.

$\cos 60^\circ = \frac{x}{2}$
 $1 = x$
 $\sin 60^\circ = \frac{y}{2}$
 $1.7 \approx y$

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Ex 2 Plot the point in rectangular coordinates.
Find two corresponding sets of polar coordinates.

$\begin{matrix} x & y \\ (-12, 5) \end{matrix}$ $(13, 157.4^\circ)$ $(-13, -22.6^\circ)$

A Cartesian coordinate system with a point plotted in the second quadrant. The rectangular coordinates are $(-12, 5)$. A right triangle is formed with the x-axis, with a horizontal leg of length 12 and a vertical leg of length 5. The hypotenuse is labeled r . The angle θ is measured counter-clockwise from the positive x-axis. Two sets of polar coordinates are listed: $(13, 157.4^\circ)$ and $(-13, -22.6^\circ)$.

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