

POLAR COORDINATES AND EQUATIONS-- Ordered pair of a polar coordinate: (r, θ)

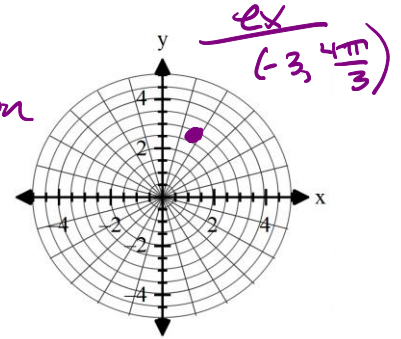
$r =$ radius $=$ half a circle

Formula for radius: $r = \sqrt{x^2 + y^2}$

$\theta =$ direction angle $=$ angle in standard position

Formula for direction angle: $\tan^{-1}\left(\frac{y}{x}\right) = \theta$

Graphing polar coordinates: go to radius on x-axis, then do the direction angle



How to find x-coordinate: $x = r \cos \theta$

How to find y-coordinate: $y = r \sin \theta$

$r^2 = x^2 + y^2$

Changing polar equations to rectangular equations:

change r & θ to x & y using
 $r^2 = x^2 + y^2$, $x = r \cos \theta$, $y = r \sin \theta$

Changing polar coordinates to rectangular coordinates:

find x & y using $x = r \cos \theta$
& $y = r \sin \theta$

Complex polar form or Trigonometric form of a complex number:

$z = r(\cos \theta + i \sin \theta)$

POLAR COORDINATES AND EQUATIONS-- Ordered pair of a polar coordinate:

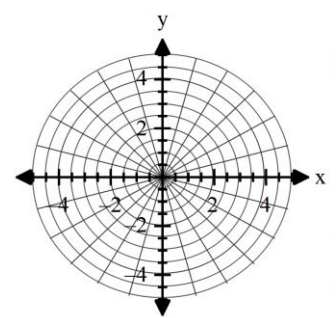
$r =$ _____ $=$

Formula for radius:

$\theta =$ _____ $=$

Formula for direction angle:

Graphing polar coordinates:



How to find x-coordinate:

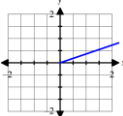
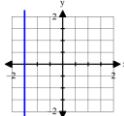
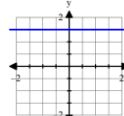
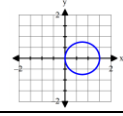
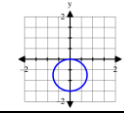
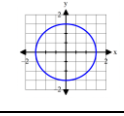
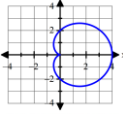
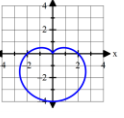
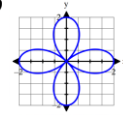
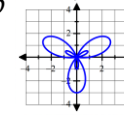
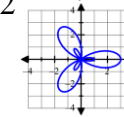
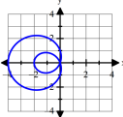
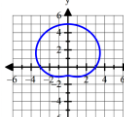
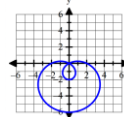
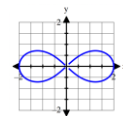
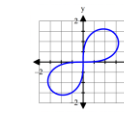
How to find y-coordinate:

Changing polar equations to rectangular equations:

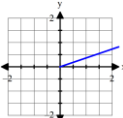
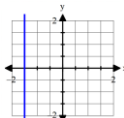
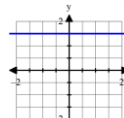
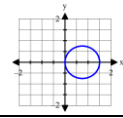
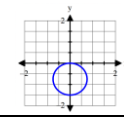
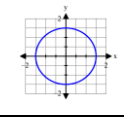
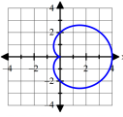
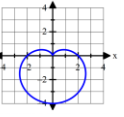
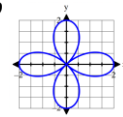
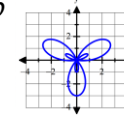
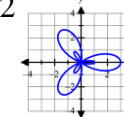
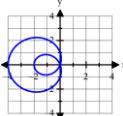
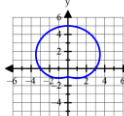
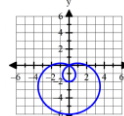
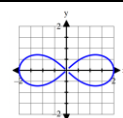
Changing polar coordinates to rectangular coordinates:

Complex polar form or Trigonometric form of a complex number:

Special types of polar equations

Type/Name of graph	Equations and Graphs	Equations and Graphs	Equations and Graphs
1. lines	$\theta = \alpha$ $\theta = 20$ lines through origin 	$r = a \sec \theta$ $r = -1.5 \sec \theta$ Vertical lines 	$r = a \csc \theta$ $r = 1.5 \csc \theta$ Horizontal lines 
2. circles	$r = a \cos \theta$ $r = 1.5 \cos \theta$ 	$r = a \sin \theta$ $r = -1.5 \sin \theta$ 	$r = a$ $r = 1.5$ 
3. cardioids must touch origin	$r = a \pm a \cos \theta$ $r = 2 + 2 \cos \theta$ 	$r = a \pm a \sin \theta$ $r = 2 - 2 \sin \theta$ 	
4. roses if n is even double the petals, if n is odd same number of petals	$r = a \cos(n\theta) + b$ $r = 2 \cos(2\theta)$ 	$r = a \sin(n\theta) + b$ $r = 2 \sin(3\theta) + 1$ 	$r = 2 \cos(3\theta) + 2$ 
5. limacons inner loop if $0 < a < b$ no inner loop if $0 < b < a$.	$r = a \pm b \cos \theta$ $r = 1 - 3 \cos \theta$ 	$r = a \pm b \sin \theta$ $r = 3 + 2 \sin \theta$ 	$r = 2 - 4 \sin \theta$ 
6. lemniscates	$r^2 = a^2 \cos(2\theta)$ $r^2 = 4 \cos(2\theta)$ 	$r^2 = a^2 \sin(2\theta)$ $r^2 = 4 \sin(2\theta)$ 	

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