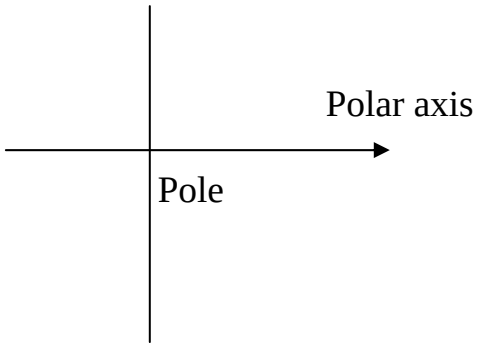
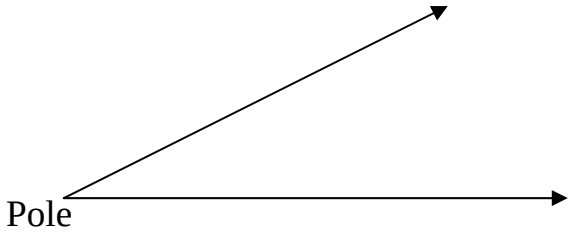
Section 8.1: Polar coordinates



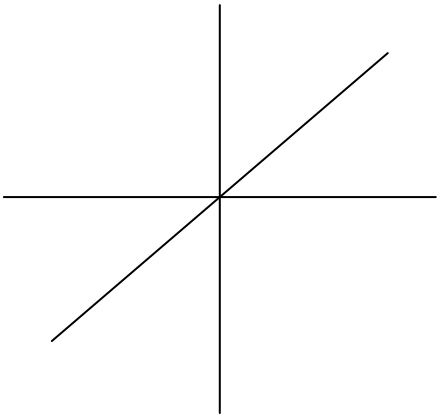


Ex: Plot the following points $(2,\frac{\pi}{3})$, $(3,-\frac{2\pi}{3})$, $(2,\frac{7\pi}{6})$

Finding Several polar coordinates of a single point:

EX: $(2,\frac{\pi}{3})$

Polar coordinates (r,θ), $r<0$:



Ex: Plot $(2,\frac{4\pi}{3})$, *and* $(-2,\frac{4\pi}{3})$

Notes:

1) In rectangular coordinates each point has exactly one pair of rectangular coordinates.
2) In polar coordinates each point has infinitely many pairs of polar coordinates.

EX: Select ALL representation of the following points:

1) $(r,\theta)=(-2,\frac{5\pi}{3})$

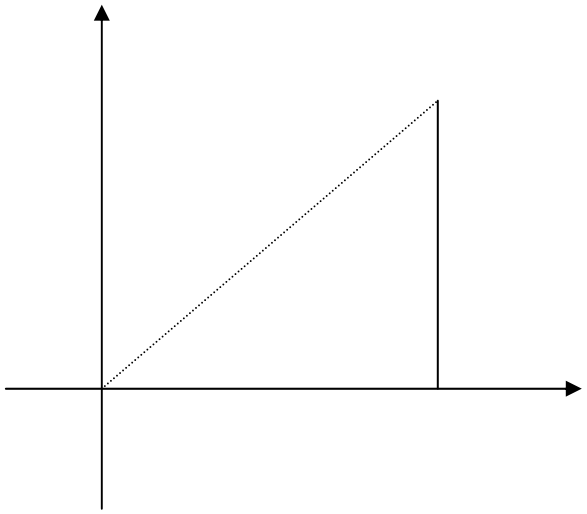
a)$(-2,\frac{2\pi}{3})$, b) $(-2,-\frac{\pi}{3})$, c) $(2,\frac{2\pi}{3})$, d) $(2,-\frac{5\pi}{3})$, e) $(2,-\frac{4\pi}{3})$

2) $(r,\theta)=(3,-\frac{5\pi}{6})$

a)$(-3,\frac{5\pi}{6})$, b) $(-3,\frac{7\pi}{6})$, c) $(-3,\frac{\pi}{6})$, d) $(3,\frac{7\pi}{6})$, e) $(-3,-\frac{11\pi}{6})$

Conversion from polar to rectangular coordinates, and Vice Versa:

Theorem:



Ex: Find the rectangular coordinates for the following polar coordinates.

1) $(-3,\pi)$, 2) $(-2,-\frac{3\pi}{4})$, 3) $(3,0)$, 4) $(6,150^{o})$

EX: Find the polar coordinates for the following rectangular coordinates

1) $(-3,3)$, 2) $(-\sqrt{3},-1)$, 3) $(-1,0)$, 4) $(0,-1)$

Transforming an equation from Polar to Rectangular and Vice Versa:

EX: Transform to polar

1) $x^2 + y^2 = x$
2) $y^2 = 2x$
3) $x = 4$
4) $x^2 - y^2 = 25$
5) $xy = 6$

EX: Transform to rectangular

1) $r = \dfrac{3}{1 - \cos\theta}$
2) $r = 2\sin\theta$
3) $\theta = \dfrac{\pi}{4}$
4) $r = \cot\theta$
5) $r = 2$
6) $r = 8\sin\theta - 2\cos\theta$
7) $r^2 = 4\sec 2\theta$
8) $r^2 = 2\csc 2\theta$
9) $r - 6\sin\theta = 0$