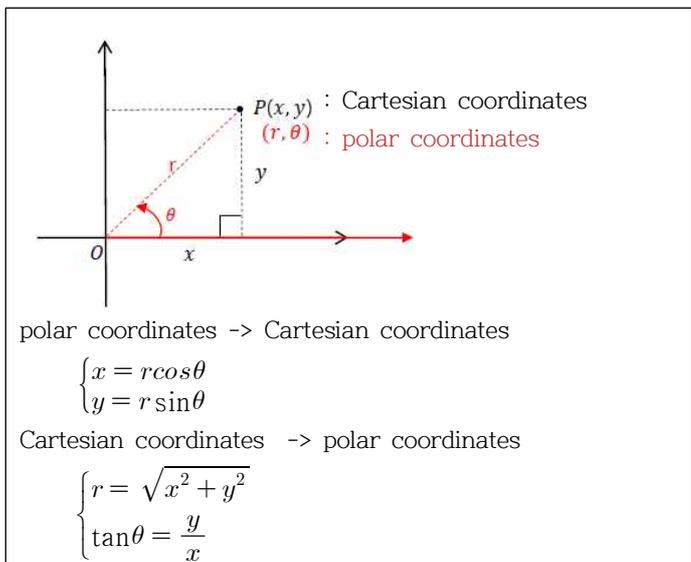


Problem Set 10.3, 10.4

Polar coordinates  $(r, \theta)$  vs. Cartesian coordinates  $(x, y)$



1. Plot the points whose polar coordinates are given.

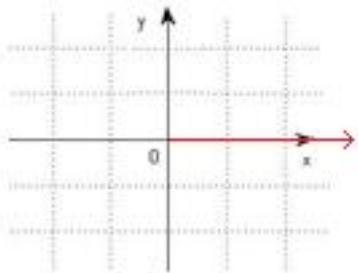
- a.  $(1, \frac{\pi}{4})$     b.  $(2, \pi)$     c.  $(1, -\frac{3\pi}{4})$     d.  $(-1, \frac{\pi}{4})$

2. The Cartesian coordinates of points are given. Find polar coordinates  $(r, \theta)$  of the point, where  $r > 0$  and  $0 \leq \theta < 2\pi$ .

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

3. Consider the polar equation  $r = 1 + \cos \theta$ .

(1) Sketch the polar curve.



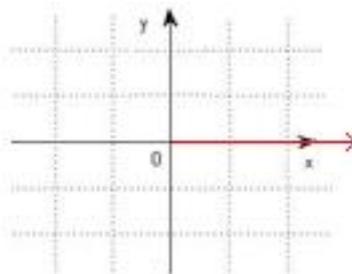
(2) Find the slope of the tangent line when  $\theta = \pi/4$ .

(3) Find the points on the curve where the tangent line is horizontal.

(4) Find the points on the curve where the tangent line is vertical.

4. Consider the polar equation  $r = \sqrt{3} \sin \theta$ .

(1) Sketch the polar curve.



(2) Find the points of intersection of the cardioid  $r = 1 + \cos \theta$  and the circle  $r = \sqrt{3} \sin \theta$ .

(3) Find the area of the region outside the cardioid  $r = 1 + \cos \theta$  and inside the circle  $r = \sqrt{3} \sin \theta$ .