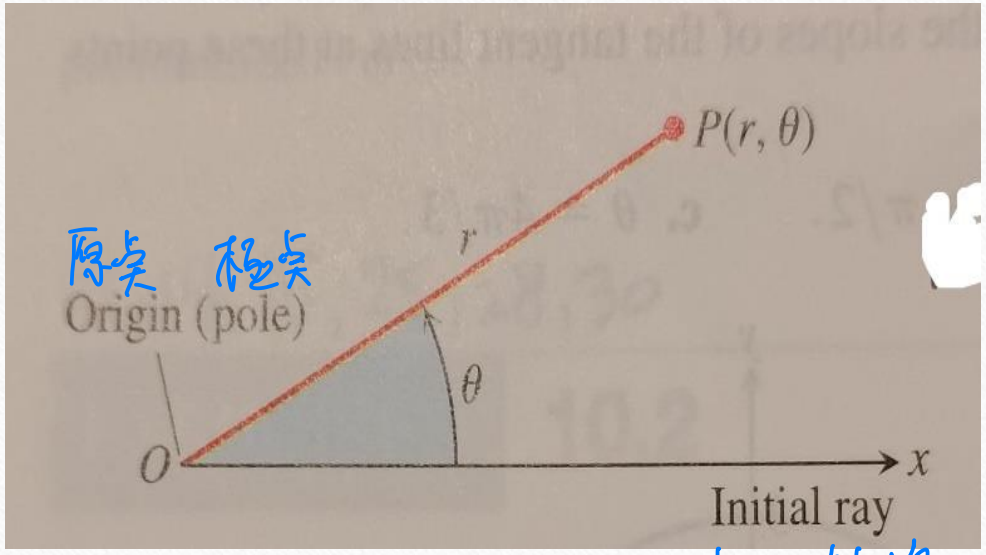
10-3 Polar Coordinates

極座標

師大工教一



原点 極点

起始射線

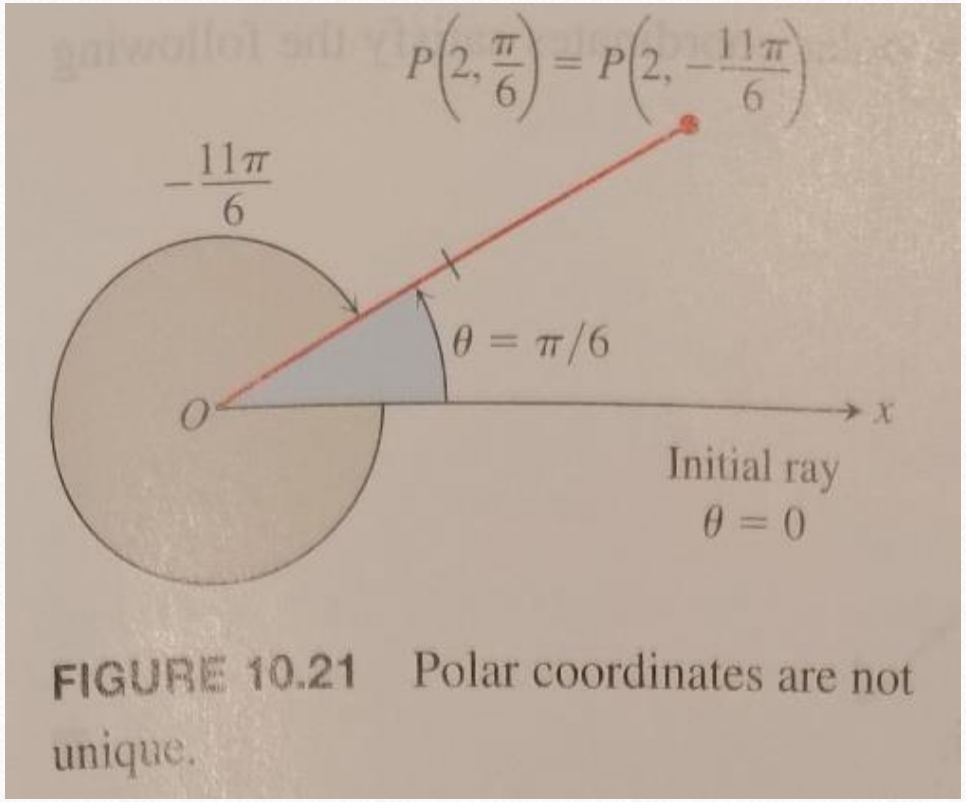


FIGURE 10.21 Polar coordinates are not unique.

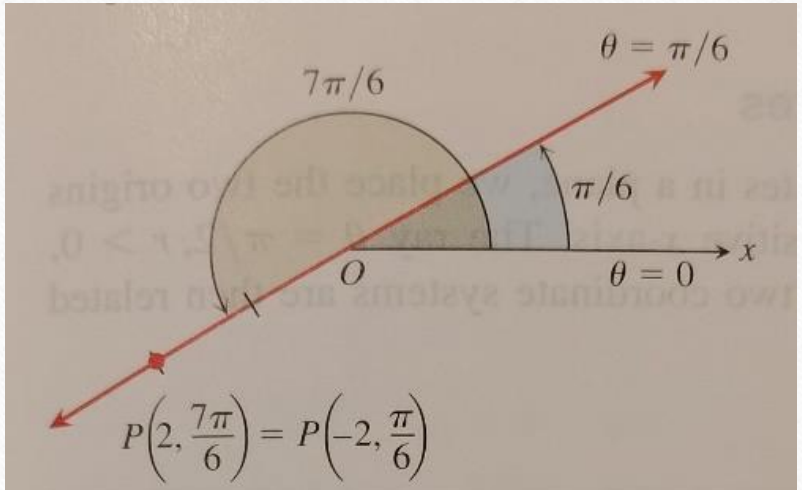


FIGURE 10.22 Polar coordinates can have negative r-values.

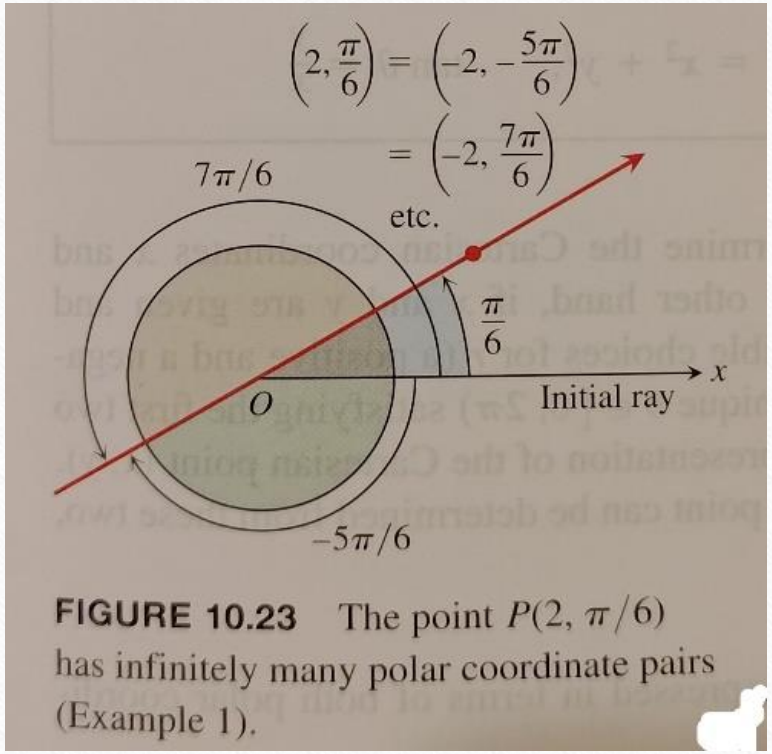


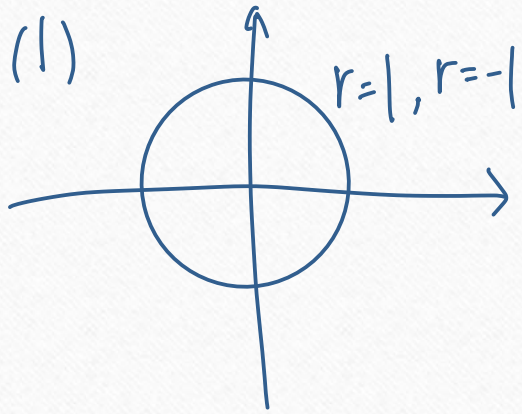
FIGURE 10.23 The point $P(2, \pi/6)$ has infinitely many polar coordinate pairs (Example 1).

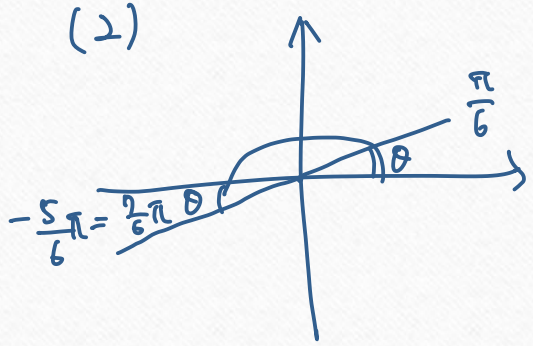
Polar Equations and Graphs

Ex2(p617) Graph the following equations in polar coordinates.

(1) $r = 1, \quad r = -1$

(2) $\theta = \dfrac{\pi}{6}, \quad \theta = \dfrac{7\pi}{6}, \quad \theta = \dfrac{-5\pi}{6}$



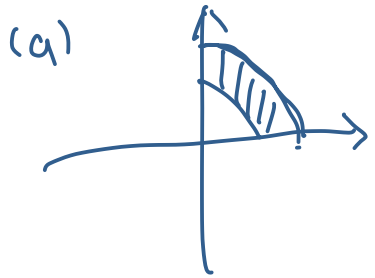


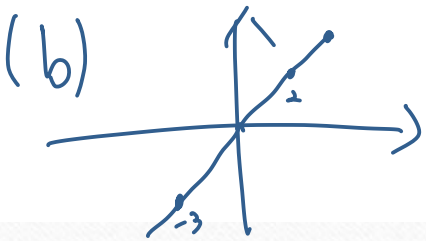
Ex3(p618) Graph the sets of points whose polar coordinates satisfy the following conditions.

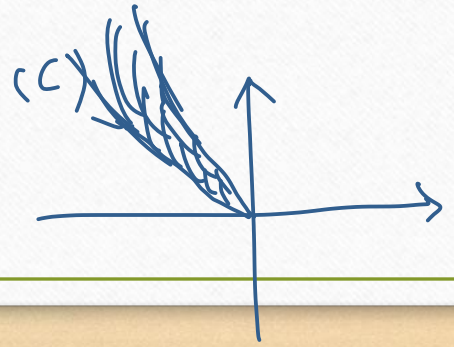
(a) $1 \le r \le 2$ and $0 \le \theta \le \frac{\pi}{2}$

(b) $-3 \le r \le 2$ and $\theta = \frac{\pi}{4}$

(c) $\frac{2\pi}{3} \le \theta \le \frac{5\pi}{6}$







Equations Relating Polar and Cartesian Coordinates

$$\begin{cases} x = r\cos\theta \\ y = r\sin\theta \end{cases} \qquad \begin{cases} r = \sqrt{x^2 + y^2} \\ \tan\theta = \dfrac{y}{x} \end{cases}$$

Ex5(p618) Find a polar equation for the circle $x^2 + (y-3)^2 = 9$.

$(r\cos\theta)^2 + (r\sin\theta - 3)^2 = 9$

$r^2 = 6r\sin\theta$

$r^2 - 6r\sin\theta = 0$

$r(r - 6\sin\theta) = 0$

$r = 0$ or $r = 6\sin\theta$

Ex6(p619) Replace the following polar equations by equivalent Cartesian equations and identify their graphs.

(a) $r\cos\theta = -4$

(b) $r^2 = 4r\cos\theta$

(c) $r = \dfrac{4}{2\cos\theta - \sin\theta}$

(a) $r\cos\theta = -4$

$x = -4$

HW10-3

- **HW: 14,15,27,33,37,59,63**