



كلية : التربية للعلوم الصرفة

القسم او الفرع : الرياضيات

المرحلة: الثانية

أستاذ المادة : ميمون ابراهيم اسماعيل

اسم المادة باللغة العربية : التفاضل المتقدم

اسم المادة باللغة الإنكليزية : **Advance Calculus**

اسم المحاضرة السادسة باللغة العربية: الاحداثيات القطبية

اسم المحاضرة السادسة باللغة الإنكليزية : polar coordinates

In this chapter, we study polar coordinates and their relation to Cartesian coordinates. While a point in the plane has just one pair of Cartesian coordinates, it has infinitely many pairs of polar coordinates. This has interesting consequences for graphing, as we will see in the next section.

To define polar coordinates, we first fix an origin O (called the pole) and an initial ray from O (Figure 2). Then each point P can be located by assigning to it a polar coordinate pair in which r gives the directed distance from O to P and gives the directed angle from the initial ray to ray OP .

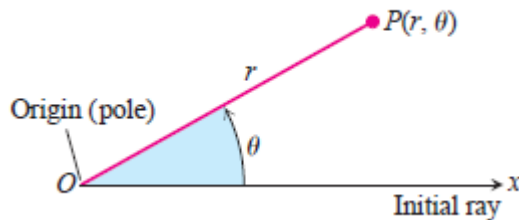


Figure 2

Example: find All polar coordinate of the points

- i) $(2, \frac{\pi}{6})$ ii) $(4, -\frac{\pi}{6})$

Solution :

i) We sketch the initial ray of the coordinate system, draw the ray from the origin that makes an angle of $\frac{\pi}{6}$ radians with the initial ray, and mark the point $(2, \frac{\pi}{6})$ (Figure 3). We then find the angles for the other coordinate pairs of P in which $r = 2$ and $r = -2$.

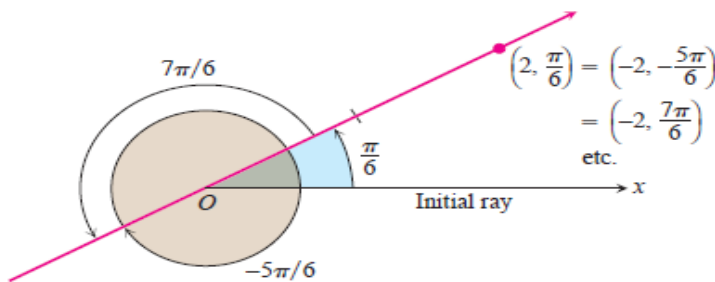


Figure 3

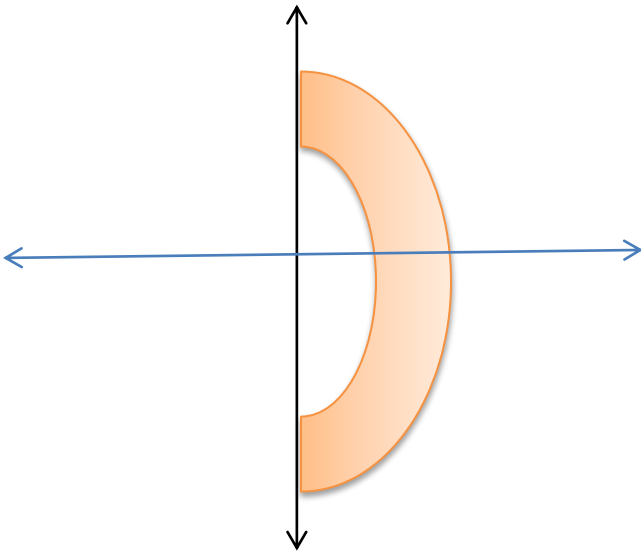
$$\left(2, \frac{\pi}{6} + 2n\pi\right) \text{ and } \left(-2, -\frac{5\pi}{6} + (2n)\pi\right), n = 0, \pm 1, \pm 2, \dots$$

$$\text{ii) } \left(4, \frac{-\pi}{6} + 2n\pi\right) \text{ and } \left(-4, -\frac{\pi}{6} + (2n + 1)\pi\right) = \left(-4, \frac{5\pi}{6} + 2n\pi\right), n = 0, \pm 1, \pm 2, \dots$$

Example : Graph the sets of points whose polar coordinates satisfy the equation

$$1) \quad -\frac{\pi}{2} \leq \theta \leq \frac{\pi}{2} \text{ and } 1 \leq r \leq 3 \qquad 2) \quad \theta = -\frac{\pi}{4} \text{ and } r \leq 0$$

1)



2)

