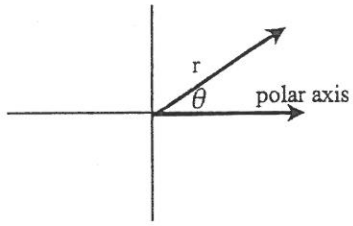


Chapter 13

Section 13.2 Polar Coordinates

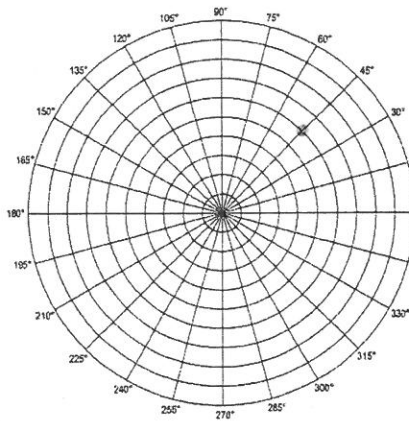


(r, θ) polar coordinates can be degree or radian

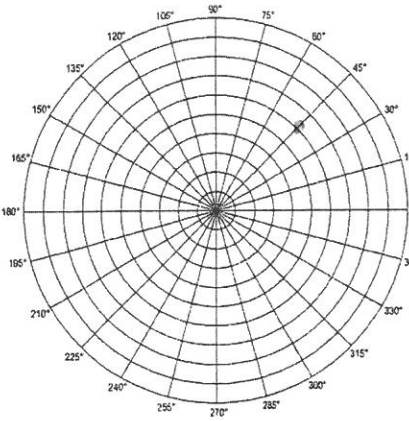
The pole is in the center where $(0, 0)$ usually is.

Plot the following polar coordinates.

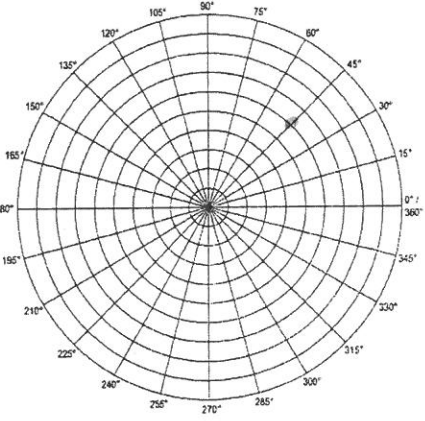
1. $(6, 45^\circ)$



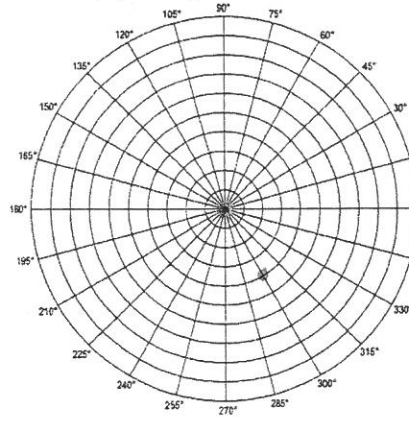
2. $(6, 405^\circ)$



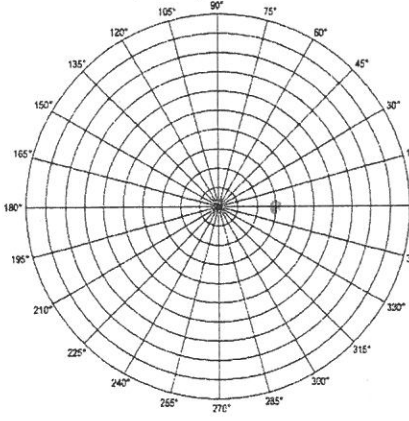
3. $(-6, 225^\circ)$



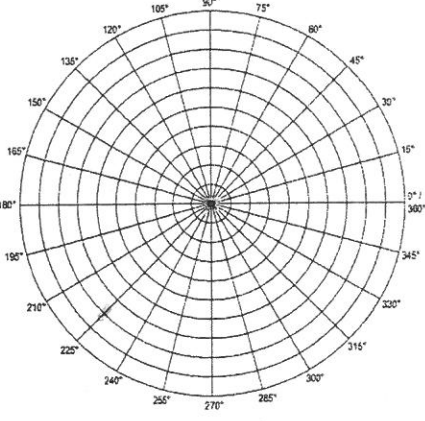
4. $(4, 300^\circ)$



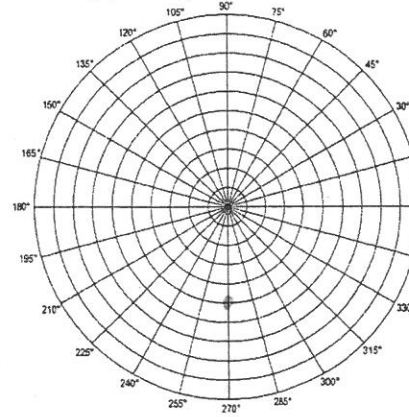
5. $(3, 0^\circ)$



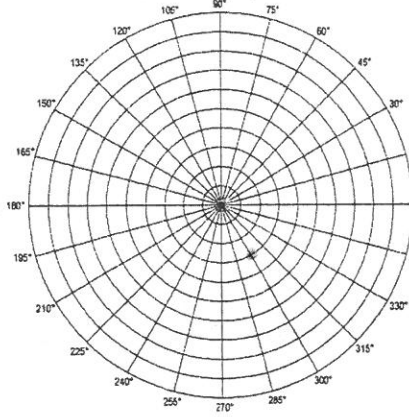
6. $(-8, 45^\circ)$



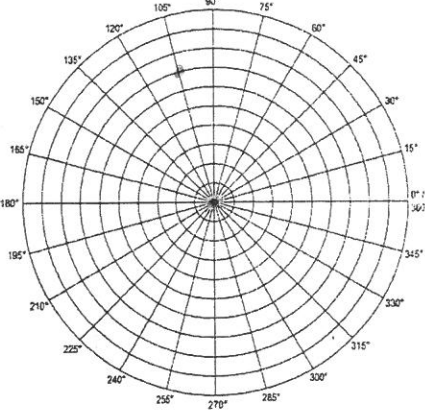
7. $(5, 270^\circ)$



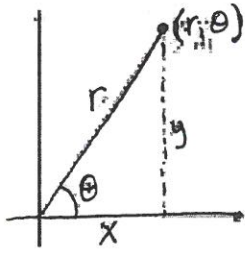
8. $(-3, 120^\circ)$



9. $(-7, -75^\circ)$



Converting from Polar Coordinates to Rectangular Coordinates



$$(r, \theta) \quad \theta = \tan^{-1} \frac{y}{x}$$

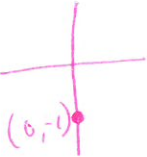
$$r^2 = x^2 + y^2$$

$$\cos \theta = \frac{x}{r}$$

$$\sin \theta = \frac{y}{r}$$

The polar coordinates are given. Find the rectangular coordinates.

10. $(4, 270^\circ)$

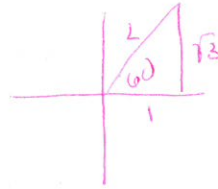


$$x = r \cos \theta = 4 \cos 270^\circ = 4$$

$$y = r \sin \theta = 4 \sin 270^\circ = -4$$

$$(0, -4)$$

11. $(-2, 60^\circ)$

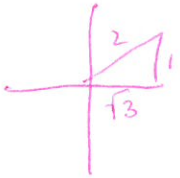


$$x = -2 \cos 60^\circ = -1$$

$$y = -2 \sin 60^\circ = -\sqrt{3}$$

$$(-1, -\sqrt{3})$$

12. $(6, 30^\circ)$

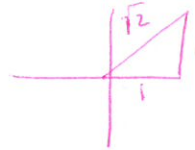


$$x = 6 \cos 30^\circ = 3\sqrt{3}$$

$$y = 6 \sin 30^\circ = 3$$

$$(3\sqrt{3}, 3)$$

13. $(-4, -45^\circ)$



$$x = -4 \cos(-45^\circ) = -4 \cos(45^\circ)$$

$$y = -4 \sin(-45^\circ) = 4 \sin(45^\circ)$$

$$x = \frac{-4}{\sqrt{2}} \quad y = \frac{4}{\sqrt{2}}$$

$$-\frac{4\sqrt{2}}{2} \quad \frac{4\sqrt{2}}{2}$$

$$\text{or } \left(\frac{-4}{\sqrt{2}}, \frac{4}{\sqrt{2}} \right)$$

$$\left(-2\sqrt{2}, 2\sqrt{2} \right)$$

Converting from Rectangular to Polar Coordinates

(Plot the point to see what quadrant. Find r . Then use inverse tangent of point to find the angle.)

14. $(0, 3)$



$$\theta = 90^\circ$$

$$r = 3$$

$$(3, 90^\circ)$$

15. $(-4, 0)$

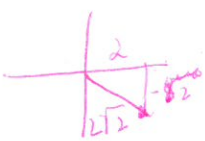


$$r = 4$$

$$\theta = 180^\circ$$

$$(4, 180^\circ)$$

16. $(2, -2)$



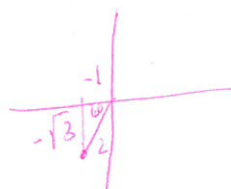
$$r = \sqrt{2^2 + (-2)^2}$$

$$r = \sqrt{8} = 2\sqrt{2}$$

$$\theta = \tan^{-1} \left(\frac{-2}{2} \right) = -45^\circ$$

$$(2\sqrt{2}, 45^\circ)$$

17. $(-1, -\sqrt{3})$



$$\theta = \tan^{-1} \left(\frac{-\sqrt{3}}{-1} \right) = 60^\circ + 180^\circ = 240^\circ$$

$$r = \sqrt{(-1)^2 + (-\sqrt{3})^2}$$

$$r = \sqrt{4} = 2$$

$$(2, 240^\circ)$$