13-1 Introduction to Polar Coordinates

The graphs of the trigonometric functions you have plotted so far have been in the familiar Cartesian coordinate system, where points are located by x- and y-coordinates. A more natural way to plot such graphs is to locate points by an angle θ in standard position and a distance r from the origin. Such graphs are said to be plotted in **polar coordinates.**

OBJECTIVE Given an equation in polar coordinates, plot the graph on polar coordinate paper.

Exploratory Problem Set 13-1

1. On polar coordinate paper (Figure 13-1a), plot the point $(r, \theta) = (7, 30°)$ by going around to an angle of 30° and then going out 7 units from the **pole** (the origin).
2. Plot the point $(r, \theta) = (-7, 210°)$ by going around to 210° and then going *back* 7 units from the pole. What do you notice about this point and the point in Problem 1?
3. Plot the points shown in the table. Connect the points in order with a smooth curve.

θ	r	θ	r
0°	10.0	195°	–5.7
15°	9.7	210°	–4.9
30°	8.9	225°	–3.7
45°	7.7	240°	–2.0
60°	6.0	255°	0.0
75°	4.1	270°	2.0
90°	2.0	285°	4.1
105°	0.0	300°	6.0
120°	–2.0	315°	7.7
135°	–3.7	330°	8.9
150°	–4.9	345°	9.7
165°	–5.7	360°	10.0
180°	–6.0		

4. Put your grapher in polar mode and degree mode. Set the window so the range for θ is from 0° to 360° and the θ-step is 5°. Use a range for x of at least [–10, 10] and a range for y of at least [–7, 7]. Enter the **polar equation** $r = 2 + 8 \cos \theta$ in the y= menu and plot the graph. Press zoom square to make the scales equal on the two axes. What do you notice about the graph?
5. From the format menu, select polar grid coordinates. Then trace to $\theta = 150°$. Does the point on the graph agree with the point in the table?
6. What did you learn as a result of doing this problem set that you did not know before?

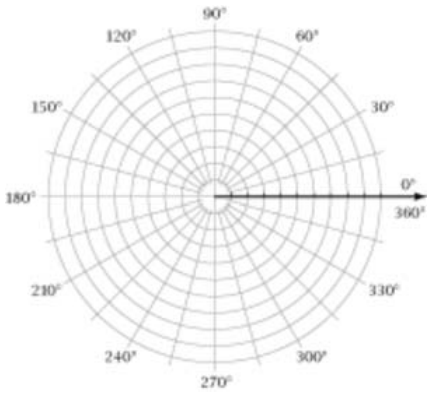

Figure 13-1a