

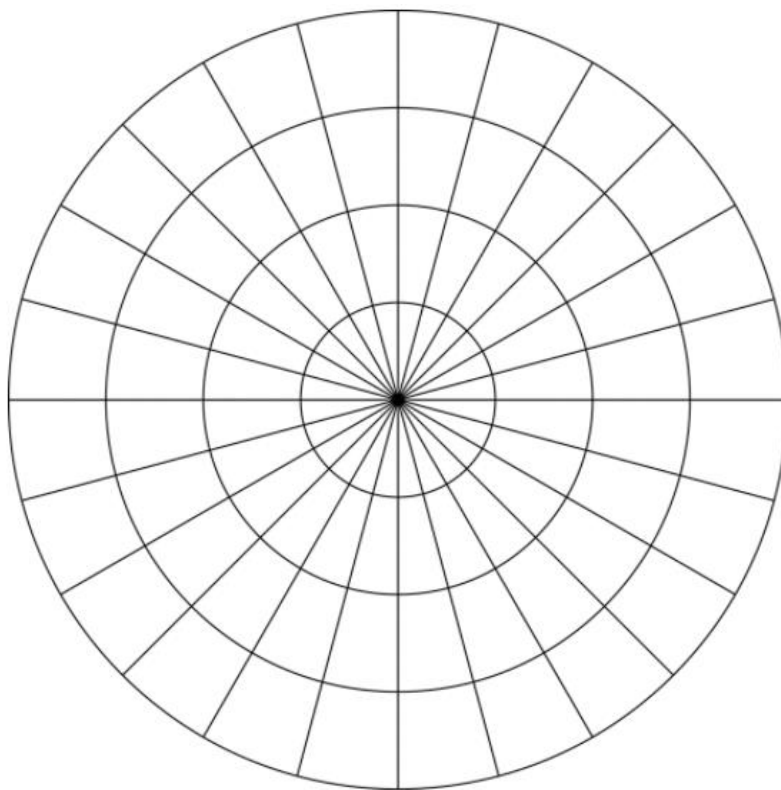
**Calculator**

1. An NFL place-kicker attempts a 40 yd field goal with an initial velocity of 70 ft/sec at a  $45^\circ$  angle with the horizontal.
  - a) Model the motion of the football using parametric equations.
  
  
  
  
  
  
  
  
  
  
  - b) To make the field goal, the football will have to clear a 10 ft high crossbar. Will the kicker make the field goal if the kick sails “true”? By how much does the ball clear or fall short (vertically) of the crossbar?
  
  
  
  
  
  
  
  
  
  
  - c) What is the ball’s maximum height above the field?
  
  
  
  
  
  
  
  
  
  
  - d) What is the ball’s “hang time” (the total time the football is in the air)?
  
  
  
  
  
  
  
  
  
  
2. Find the rectangular coordinates of the polar coordinate point  $\left(-2, -\frac{14\pi}{5}\right)$ . Approximate the coordinates to the nearest thousandth (three decimal places).

3. Find the intersection(s) of the following polar equations:  $r = 1 + 2 \cos \theta$  and  $r = 1 + \sqrt{3}$

4. Complete the table for the polar equation  $r = 1 + 2 \sin \theta$  and sketch the graph at the points in the table (only on the interval  $\frac{\pi}{2} \leq \theta \leq \frac{3\pi}{2}$ ).

$\theta$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	$\pi$	$\frac{7\pi}{6}$	$\frac{4\pi}{3}$	$\frac{3\pi}{2}$
$r$						



**Non-calculator**

5. Use an algebraic method to eliminate the parameter  $t$  and then identify the graph of the parametric curve.

$$x = 2 \sin t \quad y = 2 \cos t, \quad \frac{\pi}{2} \leq t \leq \pi$$

6. The graph of the parametric equations  $x = t - 2$  and  $y = -3t - 2$  where  $3 \leq t \leq 7$  is a line segment. Find the endpoints of this line segment.

7. Use an algebraic method to eliminate the parameter  $t$  and then identify the graph of the parametric curve.

$$x = 2 - 3t \quad y = -2t - 1$$

8. Convert  $\left(10, -\frac{\pi}{4}\right)$  from polar to rectangular coordinates.

9. Find two polar coordinate pairs for the point with rectangular coordinates  $P(-2, 2)$ .

10. Convert each polar equation to rectangular form and identify the graph.

a)  $r = \frac{1}{2} \sec \theta$

b)  $r = 3 \sin \theta - 4 \cos \theta$

11. Transform each rectangular equation to a polar equation and identify the graph.

a)  $x^2 + y^2 + 6y = 0$

b)  $(x - 4)^2 + y^2 = 16$