To begin, press **MODE** and select polar graphing by using arrow keys to move to the word “**Pol**” and press **ENTER**. Also make sure your calculator is in **Radian** mode. Press **CLEAR** to exit the mode screen.

Check the **WINDOW**: \( \theta_{\text{min}} = 0, \ \theta_{\text{max}} = 2\pi, \ \theta_{\text{step}} = \frac{\pi}{12}, \ X_{\text{min}} = -9.6, \ X_{\text{max}} = 9.4, \ X_{\text{sc}} = 1, \ Y_{\text{min}} = -6.4, \ Y_{\text{max}} = 6.2, \ Y_{\text{sc}} = 1 \)

You will go to **Y=** to input the equations. You will now see \( r = \) in this menu because we are in polar mode. Use the **X, T, \theta, n** button to get \( \theta \) in the equation. Press the **GRAPH** button to see the graph. Sketch the graph as accurately as possible on the graph paper.

In all of the groups below, use the first two to figure out the pattern and then see if you can graph the final one in the group before using the calculator. Pay special attention to where each curve hits the \( x \) and \( y \)-axes. Also observe which trig function creates symmetry on which axis.

### Circles:
(Be able to state the center as a polar coordinate and state the radius. Also be able to state the obvious endpoints of the diameter as a polar coordinate.

1. \( r = 2 \cos(\theta) \)
2. \( r = -4 \sin(\theta) \)
3. \( r = 3 \sin(\theta) \)
4. \( r = 4 \)
5. \( r = 2 \)
6. \( r = 3 \)

### Cardioid:

7. \( r = 2 + 2 \sin(\theta) \)
8. \( r = 3 - 3 \cos(\theta) \)
9. \( r = 1 + \cos(\theta) \)

### Limacon with inner loop:

10. \( r = 2 - 4 \sin(\theta) \)
11. \( r = 2 + 3 \cos(\theta) \)
12. \( r = 3 - 4 \cos(\theta) \)

### Limacon without inner loop:

13. \( r = 4 + \cos(\theta) \)
14. \( r = 3 - 2 \sin(\theta) \)
15. \( r = 2 + \sin(\theta) \)
### Roses:
16. \( r = 4 \sin(3\theta) \)
17. \( r = 3 \sin(5\theta) \)
18. \( r = -5 \cos(3\theta) \)
19. \( r = 3 \sin(2\theta) \)
20. \( r = 4 \cos(4\theta) \)
21. \( r = -5 \cos(2\theta) \)

### Lemniscate:
22. \( r^2 = 16 \cos(2\theta) \)
   Graph this by putting in both of the following equations:
   \[
   r_1 = 4\sqrt{\cos(2\theta)} \\
   r_2 = -4\sqrt{\cos(2\theta)}
   \]
23. \( r^2 = 25 \sin(2\theta) \)
24. \( r^2 = 36 \cos(2\theta) \)

### Lines (solve for \( r \) first):
25. \( r \cos \theta = 2 \)
26. \( r \sin \theta = -1 \)
27. \( r \cos \theta = -3 \)
28. \( r \sin \theta = 4 \)