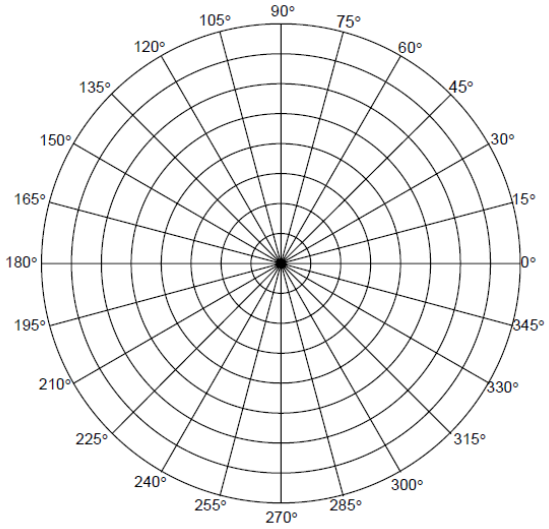
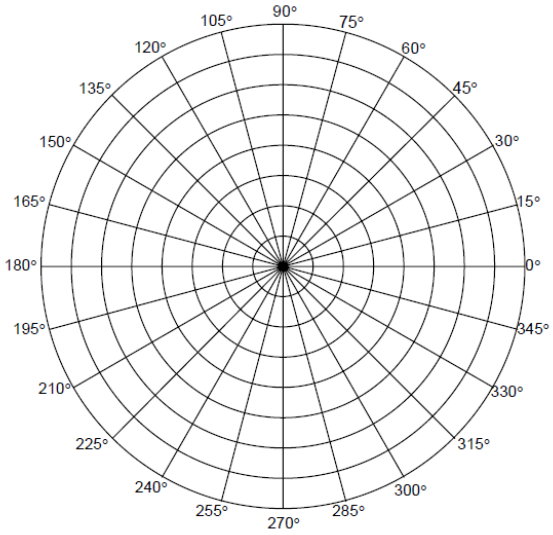
Graphing Polar Equations

I. Sketch each graph. Any change of scale must be noted on the graph.

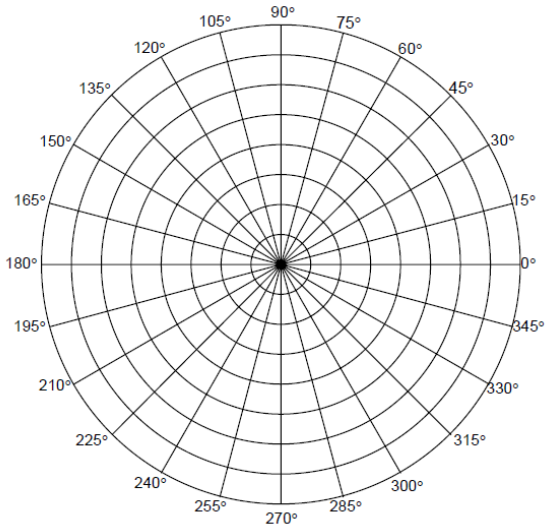
a) $r = 6cos\theta$



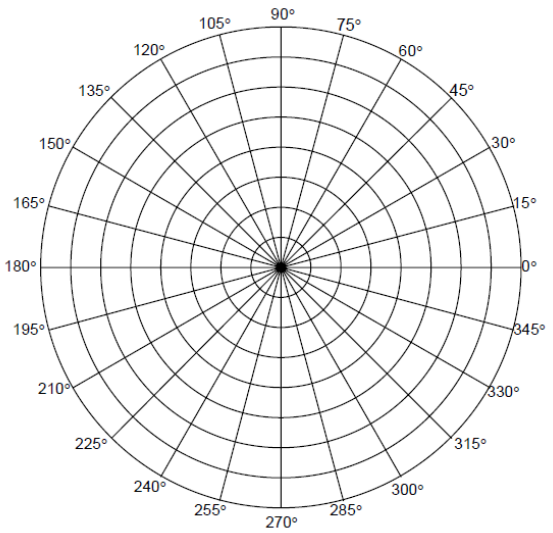
c) $r = -12cos\theta$



b) $r = 10cos\theta$



d) $r = -14cos\theta$



These polar graphs appear to be **<u>circles</u>**: $r = acos\theta$

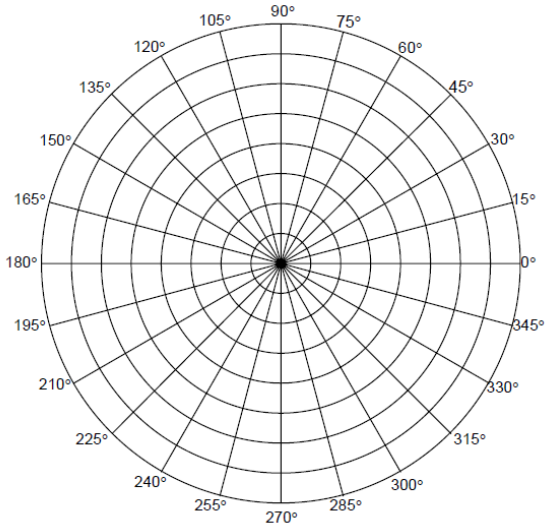
1. Draw a conclusion concerning the radius of the circle based on the graphs and value of ***a***.

2. Experiment with different values of ***a*** using a graphing calculator. Draw a conclusion for $r = acos\theta$ based on whether ***a*** is positive or negative.

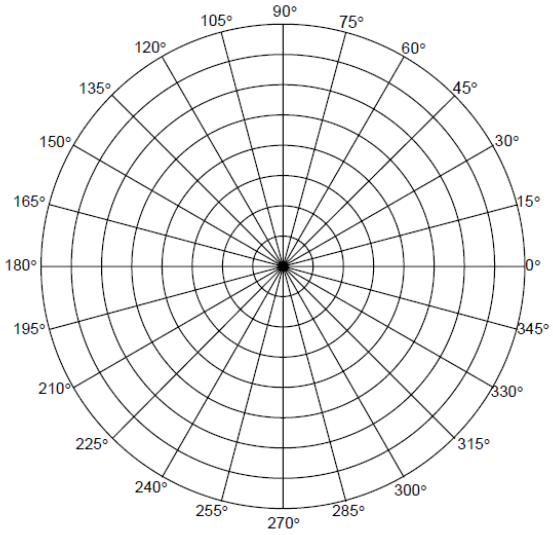
3. These graphs are symmetric to _____.

II. Sketch each graph. Any change of scale must be noted on the graph.

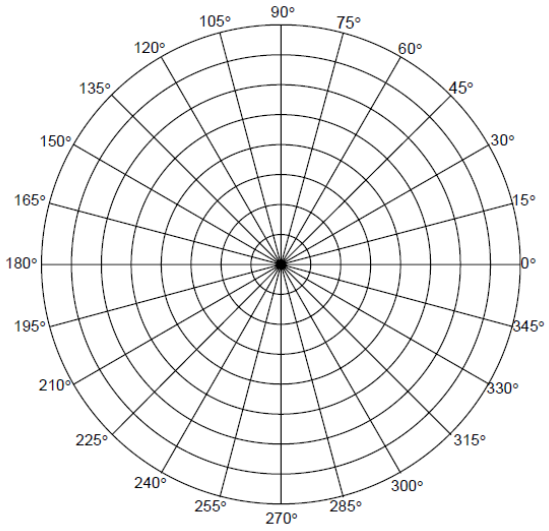
a) $r = 8sin\theta$



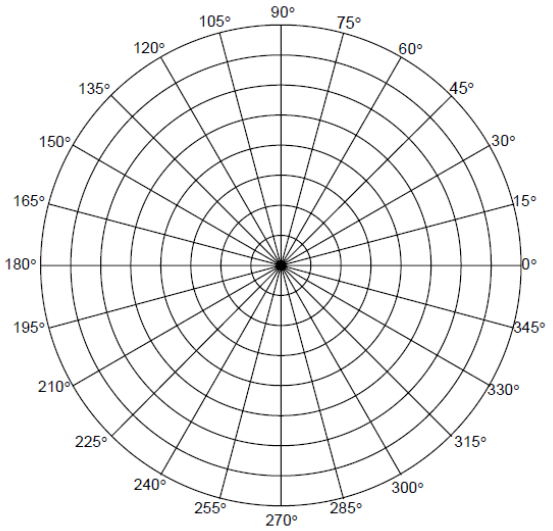
c) $r = -12sin\theta$



b) $r = 10sin\theta$



d) $r = -16sin\theta$



These polar graphs also appear to be **<u>circles</u>**: $r = asin\theta$

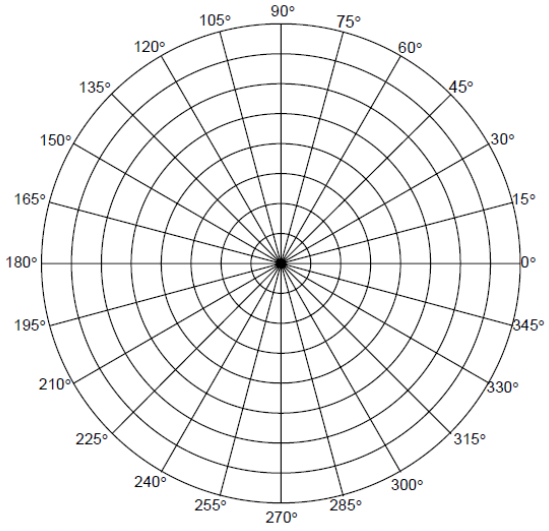
1. Draw a conclusion concerning the radius of the circle based on the graphs and value of ***a***.

2. Experiment with different values of ***a*** using a graphing calculator. Draw a conclusion for $r = asin\theta$ based on whether ***a*** is positive or negative.

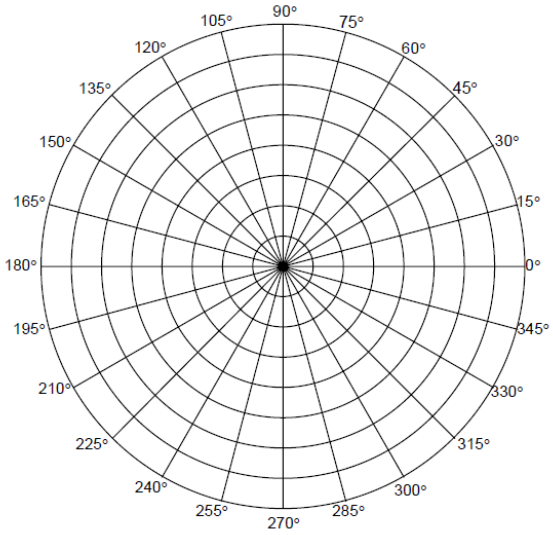
3. These graphs are symmetric to _____.

III. Sketch each graph. Any change of scale must be noted on the graph.

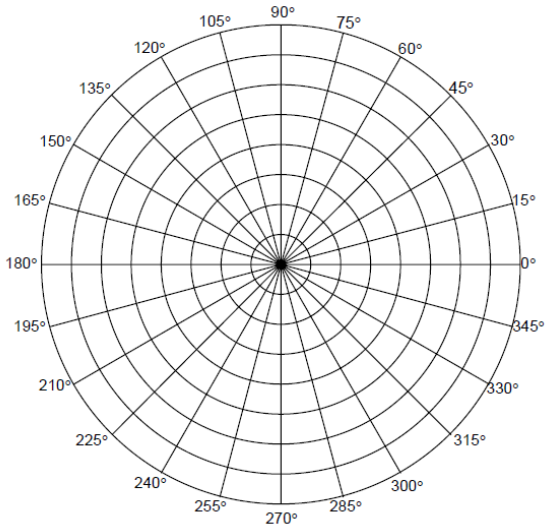
a) $r = 3 + 5cos\theta$



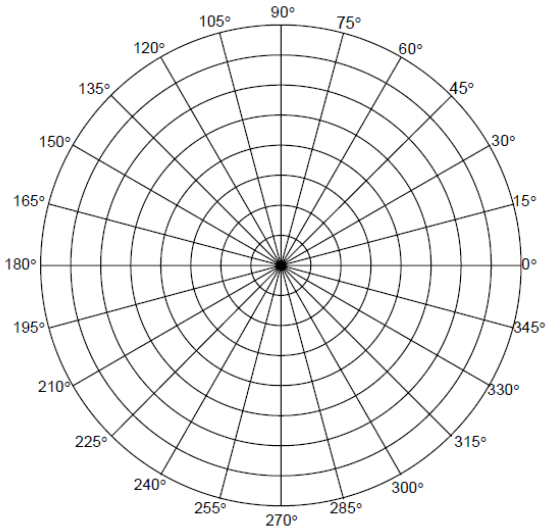
c) $r = 4 + 6sin\theta$



b) $r = 2 + 6cos\theta$



d) $r = 4 + 3sin\theta$



These polar graphs are called **<u>límaçons</u>**: $r = a + bcos\theta$ or $r = a + bsin\theta$

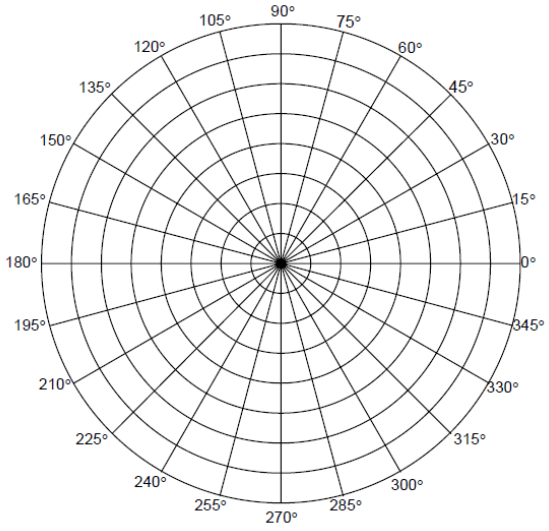
1. Draw a conclusion concerning the line(s) of symmetry.

2. Compare the graphs of $r = 5 + 8cos\theta$ and $r = -5 + 8cos\theta$. What do you notice? Experiment with different values of ***a*** and ***b*** using a graphing calculator.

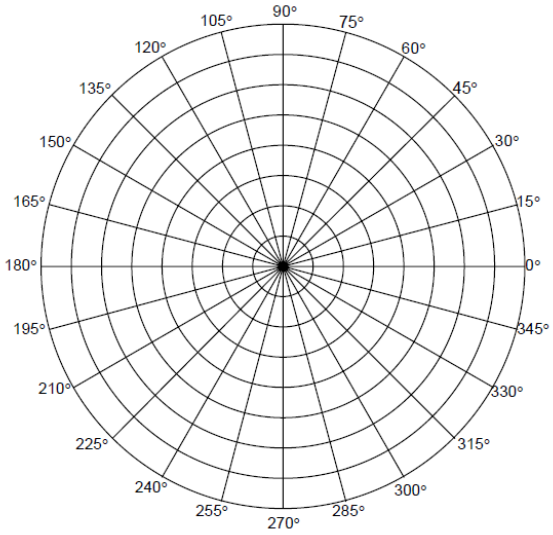
3. What happens to the graph from part (a) if you use the equation: $= -3 - 5cos\theta$?

IV. Sketch each graph. Any change of scale must be noted on the graph.

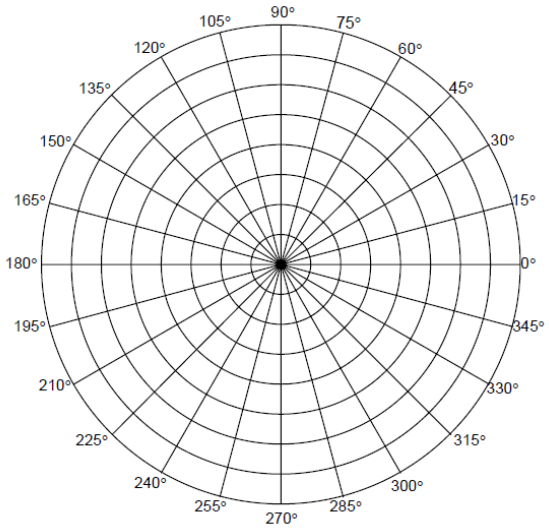
a) $r = 4 + 4cos\theta$



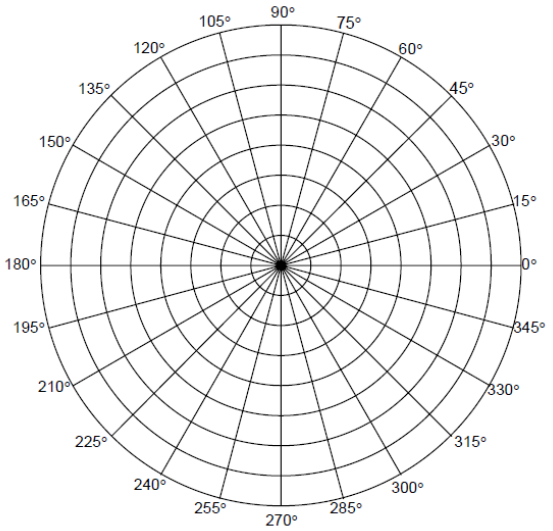
c) $r = -6 - 6cos\theta$



b) $r = 3 + 3sin\theta$



d) $r = -8 - 8sin\theta$



These polar graphs are called **<u>cardioids</u>**: $r = a + acos\theta$ or $r = a + asin\theta$

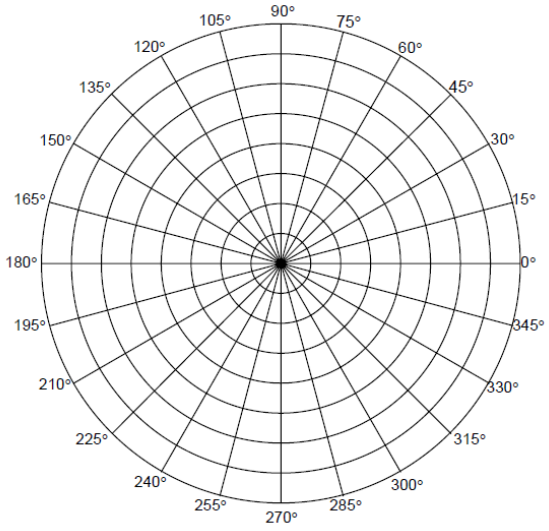
1. Draw a conclusion concerning the line(s) of symmetry.

2. For parts (a) and (c), compare the length of the graph along $\theta = 0°$ to the width along $\theta = 90°$. What do you notice?

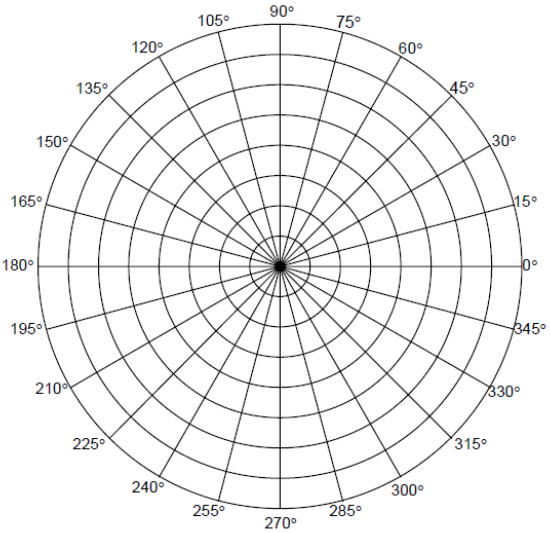
Experiment with different values of ***a*** using a graphing calculator.

V. Sketch each graph. Any change of scale must be noted on the graph.

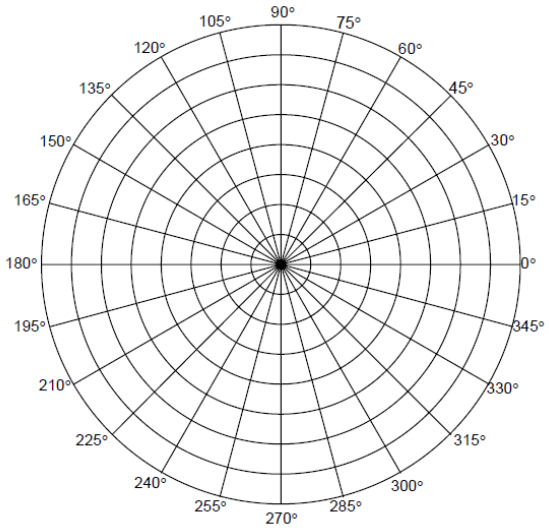
a) $r = 6cos2\theta$



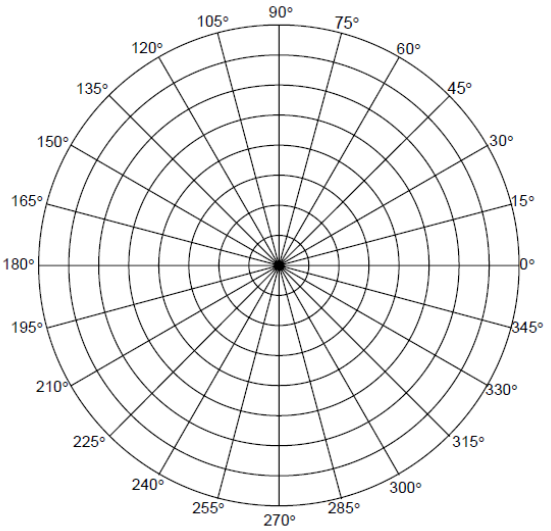
c) $r = 8sin5\theta$



b) $r = -5cos3\theta$



d) $r = -7sin4\theta$



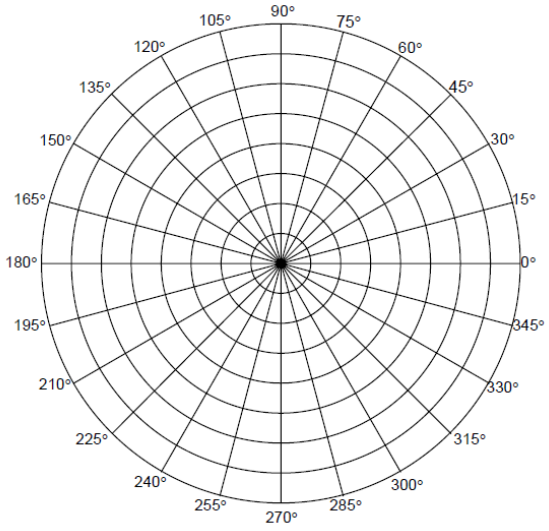
These polar graphs are called **roses**: $r = \boldsymbol{a}cos\boldsymbol{n}\theta$ or $r = \boldsymbol{a}sin\boldsymbol{n}\theta$

1. Experiment with different values of ***a*** using a graphing calculator. Draw a conclusion concerning the length of each petal.

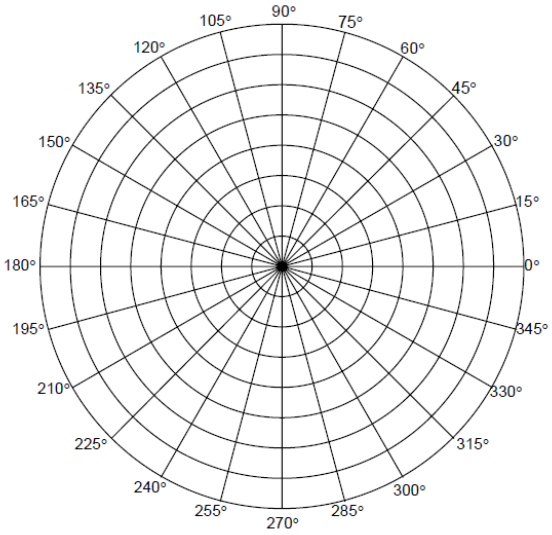
2. Experiment with different values of ***n*** using a graphing calculator. Draw a conclusion for $r = acos\boldsymbol{n}\theta$ if ***n*** is even and if ***n*** is odd.

VI. Sketch each graph. Any change of scale must be noted on the graph.

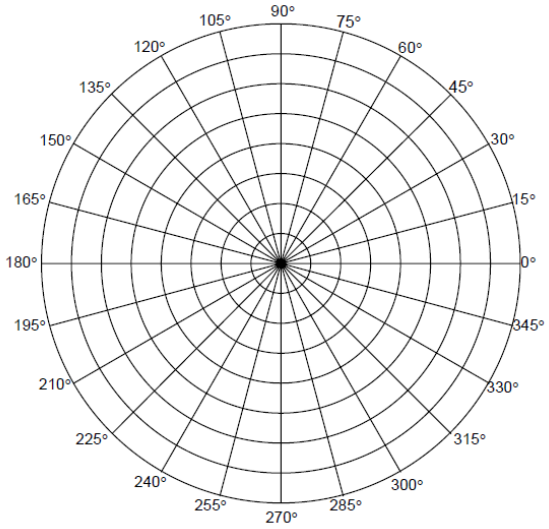
a) $r^2 = 36cos2\theta$



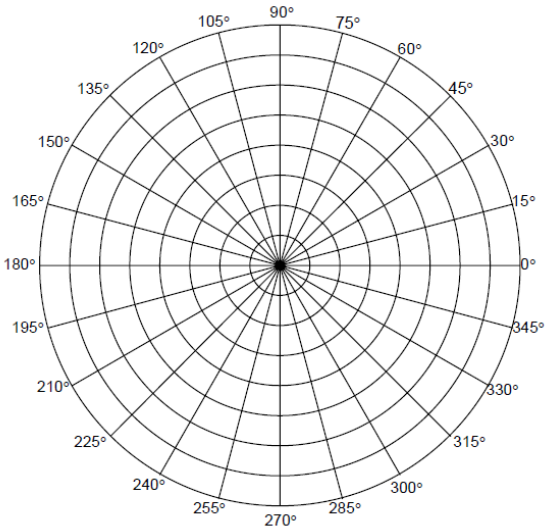
c) $\theta = 45°$



b) $r^2 = 49sin2\theta$



d) $\theta = 120°$



The polar graphs in parts (a) and (b) are called **lemniscates**.

1. Draw a conclusion concerning the number and location of the loops for $r^2 = a^2cos2\theta$.

2. Draw a conclusion concerning the number and location of the loops for $r^2 = a^2sin2\theta$.

3. Draw a conclusion about the length of the loops.

The polar graphs in parts (c) and (d) are called **lines**.