12th Grade Assignment – Week #13

<u>Group Assignments</u>:

for Tuesday – **Polar Graphing** (by hand)

Graph the following polar equations by hand. Try to avoid the temptation of using a graphing application (except, perhaps, for checking your answers). (Graph paper is on the next page.)

1. $r = -6 \sin \theta$
2. $r = \cos(3\theta)$
3. $r = \cos(4\theta)$
4. $r = \cos(\theta + {}^\pi/_4)$
5. $r = \dfrac{3}{\cos \theta}$
6. $r = 2 - 6 \sin \theta$
7. $r = 5 + 5 \cos \theta$

for Thursday – **Polar Graphing** (using a graphing application)

For these problems, your goal is to discover some of the properties of polar graphing, with the assistance of a graphing application – perhaps *Desmos*.

Here are some tips for using *Desmos* (www.desmos.com):
- When you use "r" and "θ", *Desmos* automatically assumes a polar graph.
- Type "theta" to get "θ", and type "pi" to get "π".
- To get a polar coordinate system, click on the wrench symbol, shown here → and then click on the polar grid, shown below.
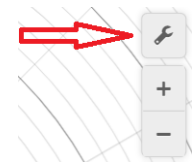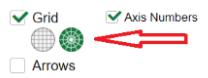

Do the following problems:

(<u>Note</u>: In every case below, I have used the constant 4 to make the graph more readable. You can instead either ignore the 4, or assign it to something else.)

8. Given a polar equation in this form: $r = d \cos(\theta)$, where d is any real number (e.g., 8), what does the value of d indicate about the graph?

9. Given a polar equation in this form: $r = 4 \cos(k\theta)$, where k is a positive integer, what does the value of k indicate about the graph?

10. Given a polar equation in this form: $r = 4 \cos(\theta + c)$, where c is any real number (e.g., ${}^\pi/_4$), what does the value of c indicate about the graph?

11. What is the difference between $r = 4 \cos(2\theta)$ and $r = 4 \sin(2\theta)$?

12. Given a polar equation in this form: $r = n + m \cos \theta$, where n, m are positive integers, what do the values of n and m indicate about the graph?

<u>Individual Work</u>
- Work on **Problem Set #5** from *Cartesian Geometry – Part IV* (but not problems #19-22, which is for group work.)
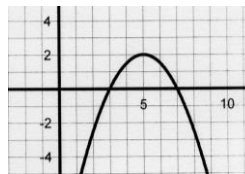
Graph Paper for Polar Equations
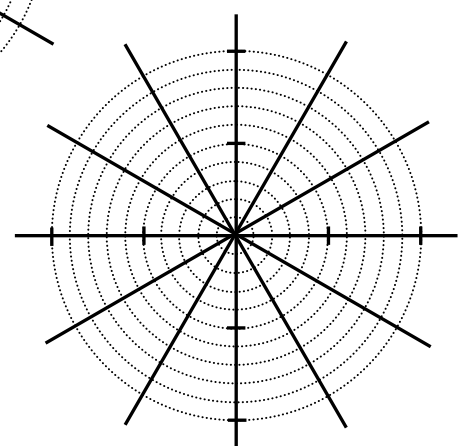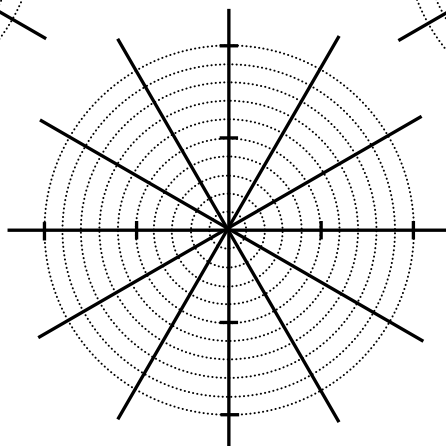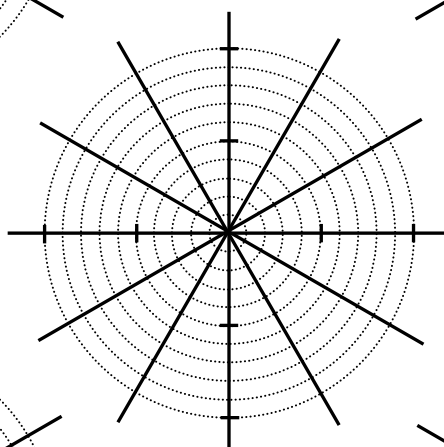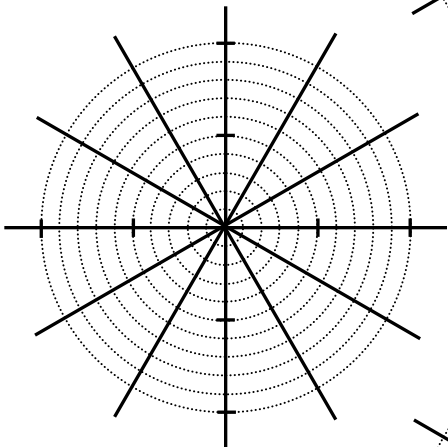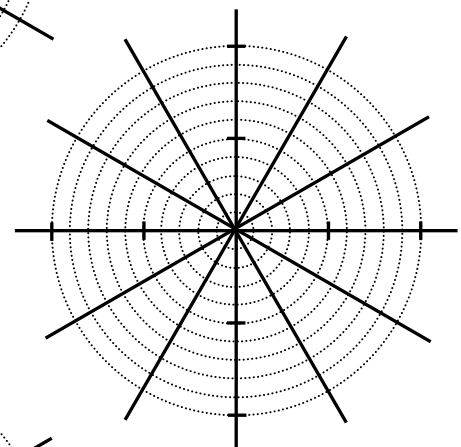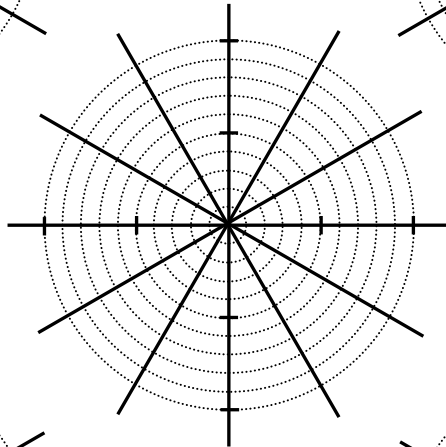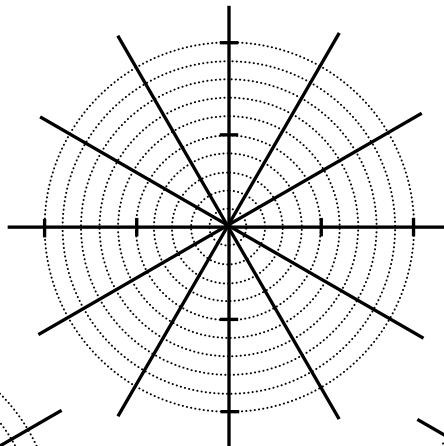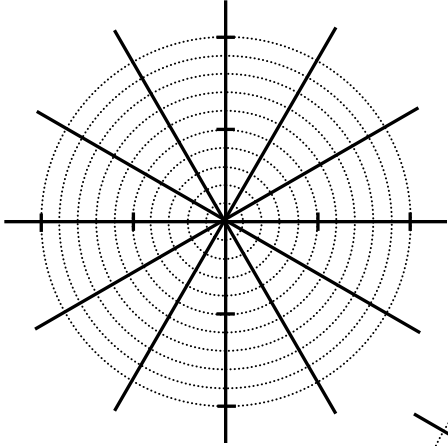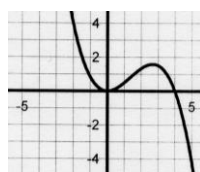
Problem Set #5

Graph each function.

1) $f(x) = 10^x - 3$

2) $f(x) = 4^{x+3}$

3) $f(x) = e^x$

4) $f(x) = 3 + 2^{-x}$

5) $f(x) = \log_4(x-2)$

6) $f(x) = \ln x$

7) $f(x) = -\ln x$

8) $f(x) = \log_2(4x)$

9) $f(x) = 3\log_5(-x)$

10) $f(x) = \frac{4x^2 - 4}{x^2}$

11) $f(x) = \frac{4x^2 + 4}{x^2}$

12) $f(x) = \frac{4x^2 - 4}{x^2 - 4}$

13) $f(x) = \frac{4x^2 - 4}{x^2 + 4}$

14) $f(x) = \frac{2x^2 + 2x}{x^2 - 4x + 4}$

15) $f(x) = \frac{x^2 + 2x - 8}{x-2}$

16) $f(x) = \frac{x^2 + 2x - 8}{x+2}$

17)

Give the equation of each function, as shown by the graph.

a) The vertex is (5,2), and the roots are $x = 3$ and $x = 7$.

b) The roots are $x = 0$ and $x = 4$. It passes through the point $(-2,4)$.

18) (Calculus is required!)
With #17b (above), find the exact coordinates of the peak (local maximum) that occurs between $x = 2$ and $x = 3$.

Graphing Polar Equations

19) $r = \cos(3\theta)$

20) $r = -6\sin\theta$

21) $r = 2 - 6\sin\theta$
(This is a limaçon)

22) $r = 5 + 5\cos\theta$
(This is a cardioid)