Analysis Honors – Hahn / Hlasek / Tantod When life gives you lemniscates, _____
Unit 3: Polar and 3D Graphing _____ Period: _____
Big Quiz – No Calculators 65 points

Part I: Polar Graphing

Questions 1-2 are Multiple Choice: Circle the best answer for each problem. [2 pts each]

1. Which is a line of symmetry for $r = -5sin7\theta$?

a) $\theta = \frac{2\pi}{7}$ b) $\theta = 0$ c) $\theta = \frac{\pi}{7}$ d) $\theta = \frac{15\pi}{14}$ e) $\theta = \frac{6\pi}{7}$

2. The graph of $r = \frac{1}{2}(tan\theta)sec\theta$ is a _____

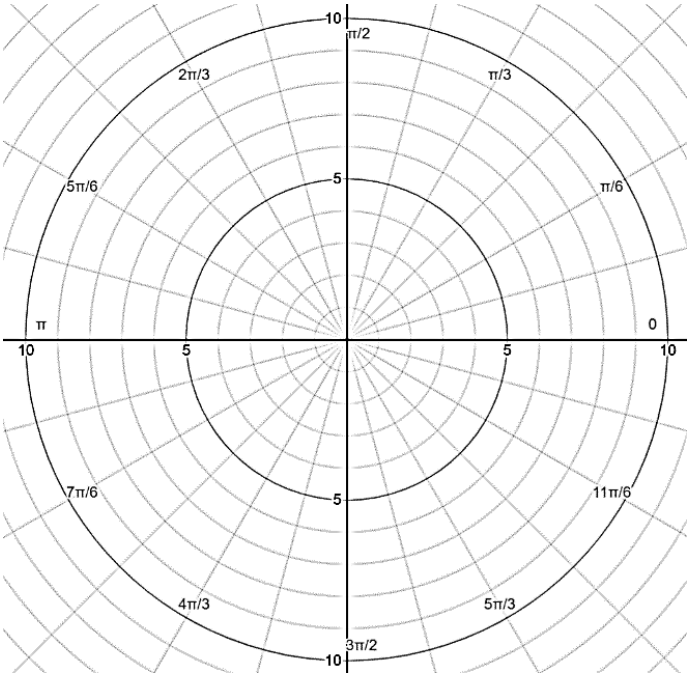
a) limacon b) parabola c) ellipse

d) hyperbola e) rose curve f) none of the above

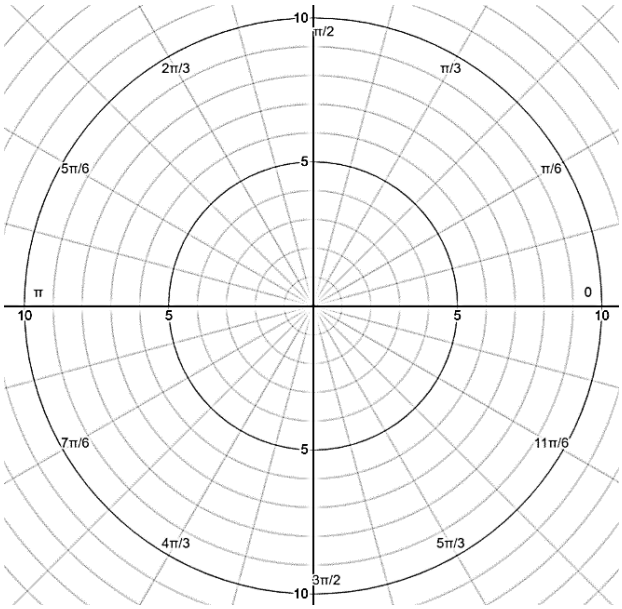
The rest of the Polar section is Free Response. Show all your work to receive credit.

3. Find **all** the the points of intersection between the two curves: $r = 1 + cos2\theta$ and $r = 1 + cos\theta$. Give your answers as polar points. (note: $r = 1 + cos2\theta$ is NOT one of the curves that we studied this unit). [4 pts]

(the graphing space on the left is for your work, but will not be graded)



4. Consider the polar points A $\left(-6, \frac{\pi}{6}\right)$ and B $\left(2, \frac{\pi}{4}\right)$.



a) Graph and label the points on the polar axis on the right. [2 pts]

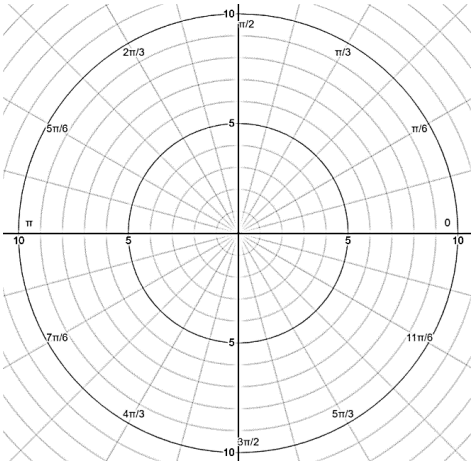
b) Find the length of line segment AB. Give your answer in exact form, but no need to simplify. [2 pts]

Length of AB = _____

5. Write the polar equation for the rose curve with eight petals, centered at the origin and passing through $(5, \frac{\pi}{8})$ with the length of each petal being 5. [3 pts]

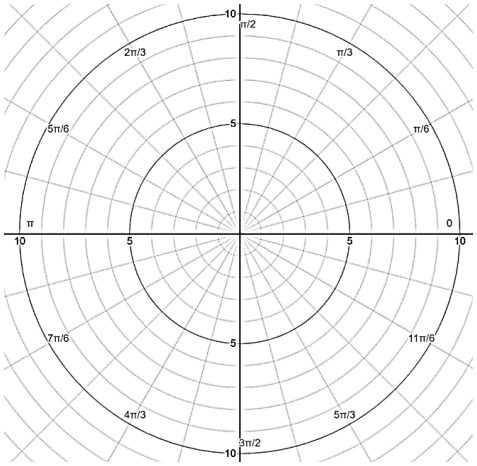
6. Graph each function. Then classify it according to its most specific name. [3 pts for each graph, 1 pt for name]

a) $r = 7\,sec\,\theta$



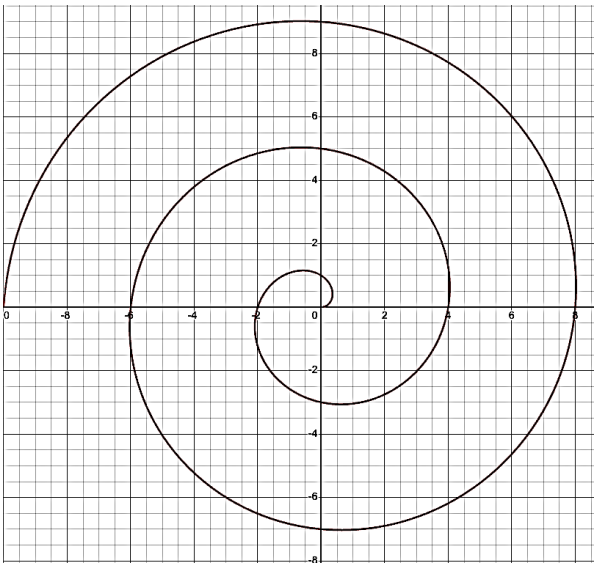
Name: _____

b) $r = 5 - 5\,sin\,\theta$



Name: _____

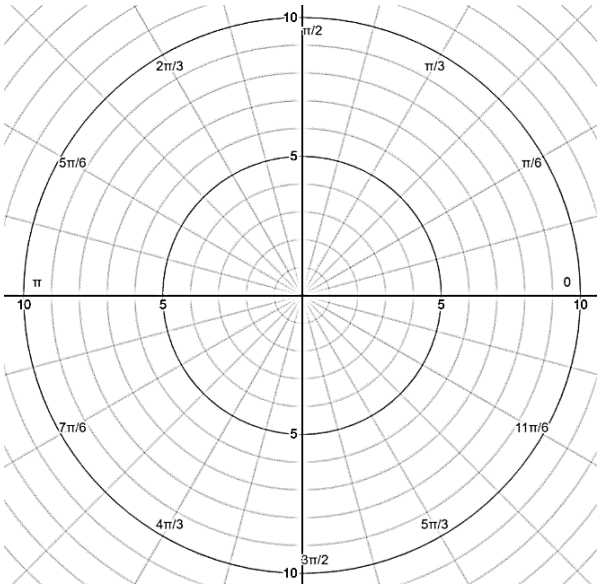
7. Write the equation of the following graph: [2 pts]



Equation:_____

8. Find **all** the points of intersection for the system of equations: $r = 3 + 6cos\theta$ and $r = 3$. Give your answers as polar points. [3 pts]

(the graphing space on the left is for your work, but will not be graded)



Part II: 3D Graphing

9. For each equation below, write the letter that represents the best name of that 3D figure. [2 pts each]

A: Plane **B**: Hyperboloid of 1 Sheet **C**: Hyperboloid of 2 Sheets

D: Ellipsoid **E**: Elliptic Cone **F**: Hyperbolic Paraboloid

G: Elliptic Paraboloid **H**: Parabolic Cylinder **I**: None of the above

i) $y^2 + z^2 = x^2$ _____

ii) $9x^2 + 4z^2 = y$ _____

iii) $x^2 + z^2 = 7 + y^2$ _____

iv) $\frac{x^2}{4} + y^2 + \frac{z^2}{9} = 1$ _____

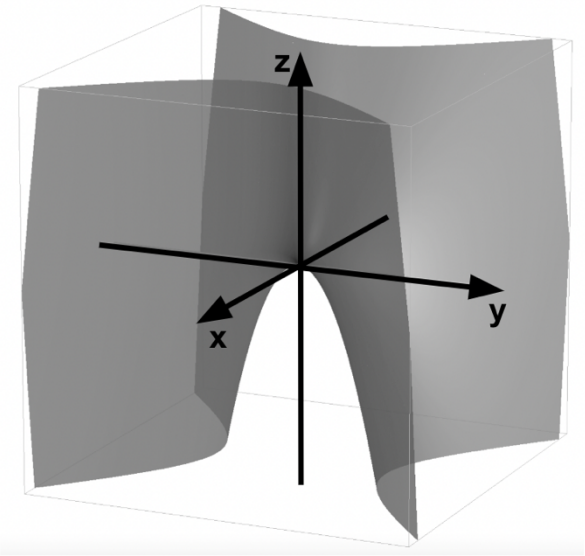
v) $x^2 - 9y^2 = z - 8$ _____

vi) $2x + 3y + z = 1$ _____

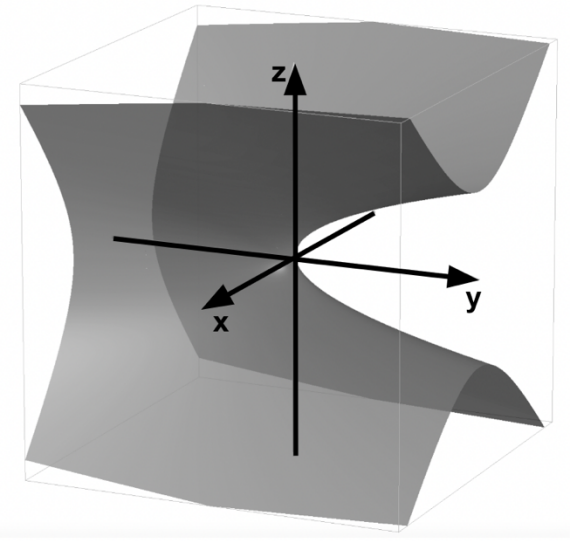
10. For each 3D graph below, write the letter with the equation that corresponds to the graph. [2 pts each]

J: $x^2 - y^2 = z$ **K**: $y^2 - x^2 = z$ **L**: $x^2 - z^2 = y$ **M**: $z^2 - x^2 = y$ **N**: $z^2 - y^2 = x$ **O**: $y^2 - z^2 = x$

i) _____

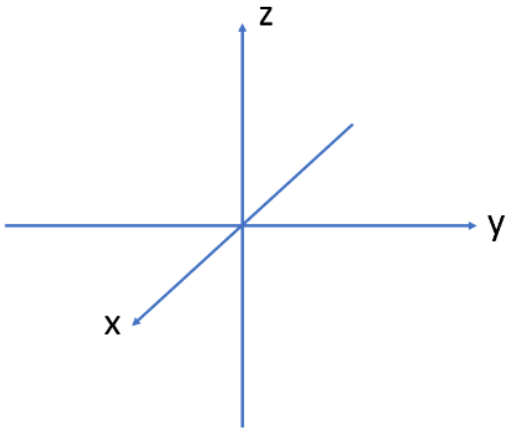


ii) _____



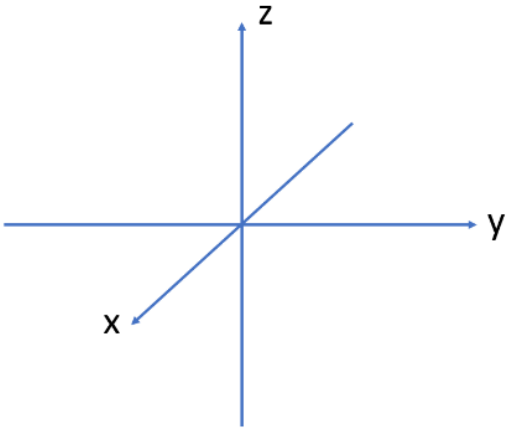
11. Sketch each 3D figure. In your sketch, label at least one point on the figure using its coordinates. Then state the name of each figure[3 pts each sketch, 1 pt name]

a) $-2x + 3y + 4z = 12$



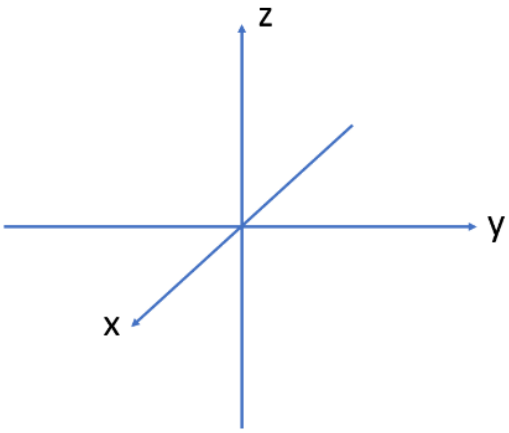
Name: _____

b) $\frac{x^2}{4} + y^2 - \frac{z^2}{9} = 1$



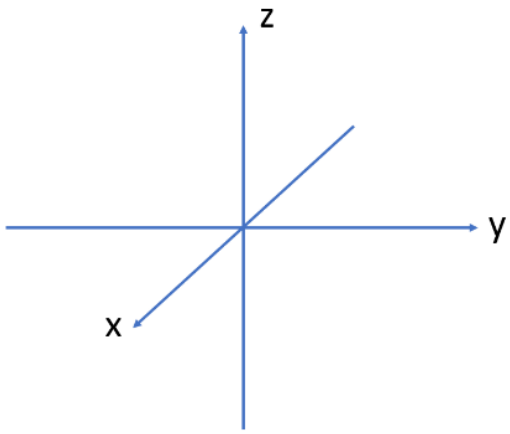
Name: _____

c) $\frac{x^2}{9} + \frac{z^2}{16} = 5 - y$



Name: _____

d) $z = (y-5)^2$

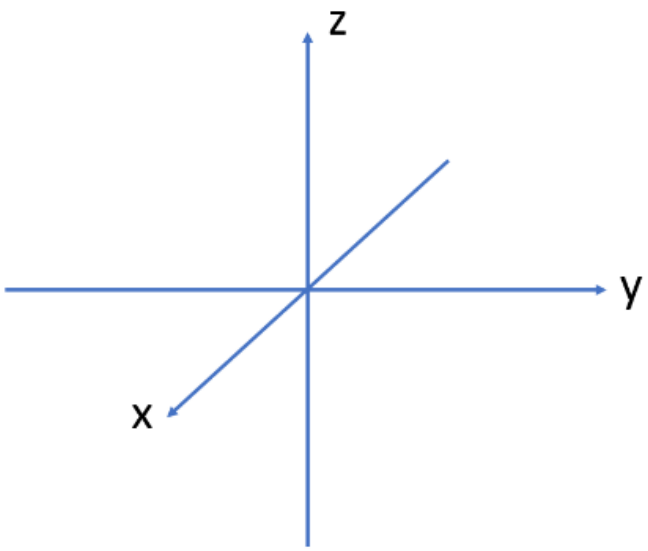


Name: _____

12. a) Fill in the boxes below with either "+", "–" , "1", or "2" to make it the equation of a hyperboloid of two sheets with vertices on the z-axis. [1 pt]

$$\square x^{\square} \; \square y^{\square} \; \square z^{\square} = 1$$

b) Sketch a hyperboloid of two sheets with vertices (0, 1, 4) and (0, 1, -4) that also passes through the point (2, 3, 12). [2pts]



c) Write the equation of the hyperboloid from part (b) in the form $a(x+b)^2 + c(y+d)^2 + e(z+f)^2 = g$, where a, b, c, d, e, f and g are **integers**. [2 pts]

Equation: _____