Exam 2 Review Topics:

Chapter 10:

Parametric Equations
- Plotting curves with calculator
- Sketching curves from plots
- Differentiating
  - Horizontal and vertical tangent lines
  - Equation of the tangent line
- Area (Finding intersection points)
- Arc Length
- Surface Area

Polar Coordinates
- Plotting points and curves
- Converting points and equations between Cartesian and Polar
- Area (Finding intersection points)
- Arc Length
*typically includes integrating even powers of sine or cosine

Conic Sections
- Plotting (Foci, Vertex, Directrix)
- Standard forms (completing the square)
- Polar Coordinates
- Eccentricity

Chapter 14:

Functions of two or more variables
- Domain and Range
- Contour Plots
- Limits
- Continuity
- Partial Derivatives
- Chain Rule
1. Find an equation for the line tangent to the curve $x = 4 \sin t, y = 2 \cos t$ when $t = \frac{\pi}{4}$.

2. Find the length of the curve $x = 3t^2, y = 2t^3$ for $0 \leq t \leq 2$.

3. Given the point $(r, \theta) = \left(2, \frac{\pi}{3}\right)$,
   a) Plot the point.
   b) Find the Cartesian coordinates of the point.

4. The figure shows the graph of $r$ as a function of $\theta$. Use it to sketch the corresponding polar graph with arrows to indicate the path.
5. Find the area of the region inside the curve \( r = 3 \cos \theta \) and outside the curve \( r = 1 + \cos \theta \).

6. Identify the type of conic section and find the vertices and foci for \( y^2 + 2y = 4x^2 + 3 \).

7. Sketch the domain of \( f(x, y) = \sqrt{4 - x^2 - y^2} \).
8. Evaluate \( \lim_{(x,y) \to (1,0)} \frac{y}{x + y - 1} \) or show that the limit does not exist.

9. Given \( f(x, y) = \ln(x - y^2) \), find \( f_{xx} \) and \( f_{yy} \).

10. If \( w = x + 2y + z^2, x = \frac{r}{s}, y = r^2 + \ln s \) and \( z = 2r \), find \( \frac{\partial w}{\partial r} \) and \( \frac{\partial w}{\partial s} \). Express answers in terms of \( r \) and \( s \).