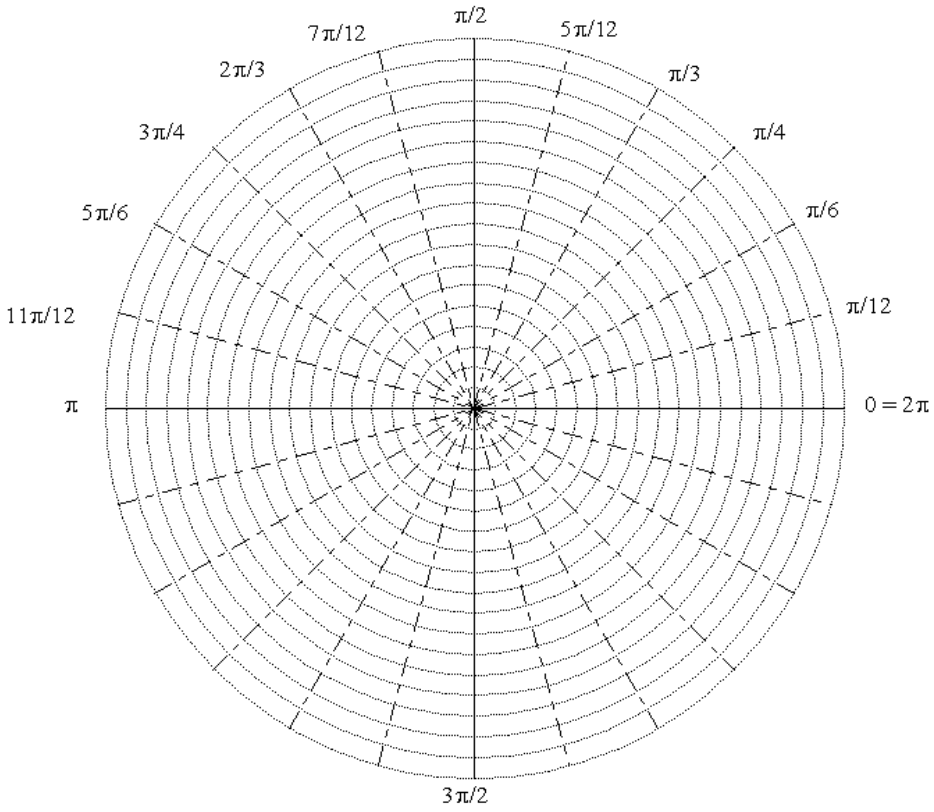
1. Consider the curves r = 3cos(θ) and r = 1 + cos(θ)

a) Sketch the curves on the same set of axes using the polar axes below




b) Find the area of the region inside the curve r = 3cos(θ) and outside the curve r = 1 + cos(θ) by setting up and evaluating a definite integral. Your work must include an antiderivative.

2. A particle moves along a curve given parametrically by x = 3 – 2cos(3t) and y = 1 + 4sin(3t).
   a) Give a sketch of the parametric curve including the direction of motion based on the equation you get by eliminating parameter t.
   b) A range of t for a single trace of the curve
   c) The equation of the line tangent to the path of the particle at t = $\pi/18$.
   d) The concavity of the curve at t = $\pi/18$.

3. Determine the length of the curve given by $y = 7(6+x)^{3/2}$ for $189 \le y \le 875$

4. Evaluate each of the following integrals:

   a) $\int 4x\cos(2-3x)dx$

   b) $\int_6^0 (2+5x)e^{x/3}dx$

   c) $\int \sin^3\left(\frac{2x}{3}\right)\cos^4\left(\frac{2x}{3}\right)dx$

   d) $\int \frac{\sqrt{x^2+16}}{x^4}dx$

   e) $\int \frac{8-3t}{10t^2+13t-3}dx$

5. Determine the area of the region bounded by $y = xe^{-x^2}, y = x+1, x = 2$ and the y - axis.

6. Determine the volume of the solid obtained by rotating the region bounded by $y = (x-1)(x-3)^2$ and the x-axis about the y-axis.

7. Evaluate the following limits:

   a) $\lim_{t\to 4} \frac{t-\sqrt{3t+4}}{4-t}$

   b) $\lim_{t\to\infty} \frac{4+7t}{2-t}$

   c) $\lim_{t\to 0+} \sin(t)^{\tan(t)}$

8. An airline requires the total outside dimensions (length + width + height) of a checked bag not to exceed 62 inches. Suppose you want to check a bag whose height is equal to its width. What is the largest volume of a bag of this shape that will meet the criteria?

9. Find the maxima/minima (if it/they exist) for the function $y = \frac{x}{1+x^2}$

10. Calculate the equation(s) of the line(s) tangent to the curve $x^3y^2 + 2xy + 5x^2 = 8$ at the point where x = 1.