Math 162 - Spring 2025
Workshop 8
Mar 24 - Mar 28
10.1-4 Parametric Equations and Polar Coordinates

Problem 1. $x = sin(t), \quad y = 1 - cos(t), \quad 0 \leq t \leq 2\pi$
(a) Sketch the curve by using the parametric equations to plot points. Indicate with arrow the direction in which the curve is traced as t increases.
(b) Eliminate the parameter to find a Cartesian equation of the curve.

Problem 2. Find parametric equations for the path of a particle that moves along the circle $x^2 + (y-1)^2 = 4$ in the manner described.
(a) Once around clockwise, starting at $(2, 1)$
(b) Three times around counterclockwise, starting at $(2, 1)$
(c) Halfway around counterclockwise, starting at $(0, 3)$

Problem 3. $x = t - ln(t), \quad y = t + ln(t)$
Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$. For which values of t is curve concave upward?

Problem 4. Identify the curve by finding a Cartesian equation for the curve
(a) $r = 4sec(\theta), \quad$ (b) $r^2 sin(2\theta) = 1 \quad$ (c) $r = 5cos(\theta)$

Problem 5. Find a polar equation for the curve represented by the given Cartesian equation.
(a) $y = \sqrt{3}x, \quad$ (b) $y = -2x^2, \quad$, (c) $x^2 + y^2 = 4y$

Problem 6. Find the area of the region that lies inside both curves
(a) $r = 3sin(\theta), \quad r = 3cos(\theta)$
(b) $r = 1 + cos(\theta), \quad , r = 1 - cos(\theta)$

Problem 7. Find the exact length of the polar curve.
(a) $r = e^{\theta/2}, \quad 0 \leq \theta \leq \pi/2$
(b) $r = 2(1 + cos(\theta))$