2924 Problem Set #5
October 1, 2019

PROBLEM 1. Describe the general procedure that would be used to calculate the integral $\int \sec^n(x)\, dx$ where n is a positive integer.

PROBLEM 2. An object moves in the xy-plane according to the parametric equations

$$x = 4t^3 + 8t^2 - 10t \,, y = 4t^3 - 48t.$$

(a) Determine those values of t for which the object is moving to the right, and to the left.
(b) Determine those values of t for which the object is moving up, and down.
(c) Find all x- and y-intercepts for the curve (d) Use your answers to (a), (b) and (c) to sketch the graph of the curve C traced by the motion.
(e) How many points of intersection Does C have with the straight line $y = x/2$?

PROBLEM 3. Find a few different parametrizations for the straight line $y = 3x - 1$.

PROBLEM 4. Show that any tangent line to a hyperbola touches the hyperbola halfway between the points of intersection of the tangent and its asymptotes.
START: Any hyperbola can be represented by a "normal form" equation

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

What are the asymptotes of this hyperbola? Draw a picture to make sure you understand what the problem is asking.