

Name: _____

Panther ID: _____

Mini-Project - MAC2311

Spring 2013 - Instructor: T. Draghici

Problem 1. (30 pts) Two railroads have the shapes of the curves $y = \frac{1}{2}x^2 + 7$ and $x^2 + y^2 = 1$. As a chief engineer for a project, you are given the task to build a straight line connection track between the two railroads so that trains can get from one curve to the other. Is this possible? Show the math required for the design of this project. (Consider the requirement that the connection be straight to be imposed by the fact that you have only straight railroad track at your disposal.)

Note: While you are expected to do most of the mathematical set-up by hand, please feel free to use wolframalpha as a tool to assist you in more technical stuff (e.g. graphing, solving systems of equations etc.). However, be careful that for graphing at least, wolframalpha is not always reliable. See below.

Problem 2. (20 pts) The flight of a bee follows the parametric curve $x = t - \cos t$, $y = 3 - 2 \sin t$, where $0 \leq t \leq 4\pi$ is the time in seconds.

- (a) At what times is the bee flying horizontally? Find the (x, y) coordinates of the corresponding points.
- (b) At what times is the bee flying vertically? Find the (x, y) coordinates of the corresponding points.
- (c) Plot this curve in wolframalpha. To my surprise, the plot I got in wolframalpha is not entirely correct. Check if this happens to you. You will receive 5 bonus points if you can point out what is wrong with the graph of this curve in the computer system.

Note: For an example similar to this problem, see Example 5 in section 10.1 of your textbook and problem 62 of the same section.