

Homework 3

Due January 19, 2017

1. Identify the critical points and determine the maximum and minimum values for the following functions on the given interval.
 - (a) (3 points) $f(x) = \sin^2(x) - \sqrt{3}\cos(x)$ on $[0, \pi]$
 - (b) (3 points) $f(x) = \sin^4(x) - \sin^2(x)$ on $\left[0, \frac{2\pi}{3}\right]$
 - (c) (3 points) $f(x) = \sin(x)$ on $[0, 5\pi]$
 - (d) (3 points) $f(x) = |\sin(x)|$ on $\left[\frac{\pi}{4}, \frac{3\pi}{4}\right]$
 - (e) (3 points) $f(x) = \frac{1}{3}x^3 - 2x^2 - 5x + 7$ on $[-5, 5]$
 - (f) (3 points) $f(x) = x^2 \sec(x)$ on $\left[-\frac{\pi}{4}, \frac{\pi}{4}\right]$
2. (4 points) A can manufacturer has 100 cm² of tin to make a cylindrical can. Find the dimensions of the can with the maximum volume he is able to make, using all of the tin he has.
3. (4 points) Team Rocket blasts off at the speed of light, which is approximately 300,000,000 m/s. Their height $h(t)$ as a function of time t is given by $h(t) = -16t^2 + 300000000t$. At what time t does Team Rocket reach their maximum height?
4. (4 points) Bob the Builder wants to carry a pole through a corridor which is 5 m wide. At the end of the hall, there is a smaller corridor 4 m wide meeting at a right angle with the main corridor. What is the longest pole that Bob can maneuver around the corner? You may assume that Bob, for some reason, must carry the pole parallel to the floor and that the pole has negligible width (the pole is a line of zero width).