

MATH 121 - Exam Review Problems

1. A certain company has the following equations for cost and revenue:

$$C(q) = 300 + 1.1q$$

$$R(q) = 5q - .003q^2$$

where q is the quantity produced. First explain what these equations mean in terms of the company. For example, how much does it cost to produce one item or are there any fixed costs? Then find the quantity that maximizes the profit for this company if $0 \leq q \leq 800$.

2. Find and classify all the critical points and state what the best bounds are for the following function:

$$\frac{x}{1+x^2}$$

3. You are a secret agent who has been trapped in a cylindrical tank by an evil super villain. The tank has a 5 meter radius and 20 meter height. The villain starts filling up the tank at a rate of $25 \text{ m}^3/\text{min}$. How fast is the water level rising? Now you look down and see that your feet are encased in cement. If you are 1.5 meters tall how long do you have to escape before you drown?

4. Your awesome professor has a disaster of a back yard with an area of 400 square feet. She has decided to offer extra credit to calculus students who come over to help clean up and plant the area. One student is designated as the supervisor and will get 5 points per hour for coordinating the other students. The working students get 10 points each just for showing up and 5 points each per hour that they work. Each student can successfully clean and plant 2 square feet per hour. What is the minimum number of points that your professor can pay to get her yard totally cleaned up? How many working students will she hire? How many hours will it take? How much extra credit will the working students earn? How much extra credit will the supervisor earn?