6.3 Optimization

Calculus Name: ______ CA #2

1. Find two positive numbers whose sum of the first and twice the second is 100 and the product is a maximum.

2. A rectangular pig pen using 100 feet of fencing is built next to an existing wall so only three sides of fencing are needed. What dimensions should the farmer use to construct the pen with the largest possible area?

3. A rectangle has its base on the x-axis and its two upper corners on the parabola $y=12-x^2$. What is the largest possible area of the rectangle?

4. A swimmer is at a point 500 meters from the closest point on a straight shoreline. She needs to reach a cottage located 1800 meters down shore from the closest point. If she swims at 4 m/s and she walks at 6 m/s, how far from the cottage should she come ashore so as to arrive at the cottage in the shortest time?

5. Your iron works has contracted to design and build a 500-cubic foot, square-based, open top, rectangular steel holding tank for a paper company. The tank is to be made by welding thin stainless steel plates together along their edges. As the production engineer, your job is to find dimensions for the base and height that will make the tank weigh as little as possible. (This means to minimize the total area of the materials being used.)

6. On a given day, the flow rate F (cars per hour) on a congested roadway is $F = \frac{v}{22 + 0.02v^2}$ where v is the speed of the traffic in miles per hour. What speed will maximize the flow rate on the road?

Answers to 6.3 CA #2

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1. 50 and 25	2. 25 × 50 feet	3. 32 square units
4. 1352.786 meters	5. $10 \times 10 \times 5$ feet	6. 33.166 mph