

Calculus

Chapter 4: Applications of Derivatives

Lesson 3: Applied Maximum and Minimum Problems

Question #1

Reference Q.545

The sum of two non-negative numbers is 10.

- Find the numbers that will make the sum of their squares as SMALL as possible.
- (Try this!) Find the numbers that will make the sum of their squares as LARGE as possible.

Question #2

Reference Q.546

What is the smallest possible perimeter for a rectangle that has an area of 25 cm^2 ?

Question #3

Reference Q.547

A rectangular area is bordered by a river on one side and by a fence on the other three sides. If there is only 500m of fencing available, what dimensions will maximize the area?

Question #4

Reference Q.548

A rectangular area is bordered by a river on one side and by a fence on the other three sides. If the area is $20,000 \text{ ft}^2$, what dimensions will minimize the amount of fence required?

Question #5

Reference Q.549

Show that a rectangle with a perimeter of 100 cm has the maximum area when it is a square.

Question #11

Reference Q.555

A sheet of glass that barely fits from floor to ceiling is being moved around a corner. If one hallway is 2.0 m wide and the other is only 1.5 m wide, what is the longest piece of glass they could fit around the corner?

Question #6

Reference Q.550

Find the length and width of the rectangle with a maximum area that can be inscribed in a circle of diameter 30.

Question #7

Reference Q.551

A rectangular box of volume 10 m^3 is to be constructed by two different types of material - the top and bottom will be made out of aluminum and costs 6.00 per m^2 , and the sides are made out of steel, at a cost of 2.00 per m^2 . If the height is 1 m, what dimensions will minimize the cost to build the box?

Question #8

Reference Q.552

An open box is to be made from a 30 cm by 80 cm piece of cardboard, by cutting our squares of equal size from the four corners and bending along the cut lines. What are the dimensions of the box of largest volume that can be made?

Question #9

Reference Q.553

A can of chocolate syrup holds 1000 cm^3 . If the top is open, find the height and radius that minimizes the amount of material needed.

Question #10

Reference Q.554

A lifeguard is running to save a child that seems to be in distress 50 m off shore. The child is about 100 m down the beach opposite the shore. If the guard can run 8 m/s on sand and swim at 3 m/s in the water, what path gets her to the child quickest? (Hint: She probably wants to run down the shore and then at the proper point swim at an angle to the child.)

Question #12

Reference Q.9204

What is the area of the largest rectangle that can be inscribed in the ellipse $2x^2 + 4y^2 = 36$?

① **Question #13**

Reference Q.9205

The circumference of the base of a cone is 10 cm more than its height. If this cone has the least volume of all cones fulfilling this condition, what is its radius?

① **Question #14**

Reference Q.9206

What is the area of the largest equilateral triangle that is contained in the unit circle, $x^2 + y^2 = 1$