Math 21A
Kouba
Max./Min. Examples

1.) Find two nonnegative numbers whose sum is 100 and so that the product of one and the square of the other is a maximum.

2.) Build a rectangular pen with three parallel partitions using 500 feet of fencing. What dimensions will maximize the total area ?

3.) An open rectangular box with square base is to be made from 75 $in.^2$ of material. What dimensions will result in the largest possible volume ?

4.) A container in the shape of a right circular cylinder with no top has surface area 3π $ft.^2$ What height h and base radius r will maximize volume ?

5.) A sheet of cardboard 3 ft. by 4 ft. will be made into a box by cutting equal-sized squares from each corner and folding up the edges. What will be the dimensions of the box with largest volume ?

6.) Consider all triangles formed by lines passing through the point (8/9, 3) and both the x- and y-axes. Find the dimensions of the triangle with the shortest hypotenuse.

7.) Find the point (x, y) on the graph of $y = \sqrt{x}$ nearest the point (4, 0).

8.) A cylindrical can is to hold 20π $in.^3$ The material for the top and bottom costs $10¢/in.^2$ and material for the sides costs $8¢/in.^2$ Find the radius r and height h of the most economical can.

9.) You are standing at the edge of a river which is one mile wide. You can swim at 2 mph and walk at 3 mph. You must swim across the river and walk to a point on the opposite bank which is 3 miles from the point directly across the river from you. What route will take the least amount of time ?

10.) Construct a window in the shape of a semi-circle over a rectangle. If the distance around the outside of the window is 12 feet, what dimensions will result in the rectangle having largest possible area ?

11.) There are 50 apples trees in an orchard. Each tree produces 800 apples. For each additional tree planted in the orchard, the output per tree drops by 10 apples. How many trees should be added to the existing orchard in order to maximize the total output of apples ?

12.) Find the dimensions of the rectangle of largest area which can be inscribed in the closed region bounded by the x-axis, y-axis, and graph of $y = 8 - x^3$.

13.) Three hundred books are sold for $40 each. For each $5 increase in price, 25 fewer books are sold. What price per book will maximize total revenue ?

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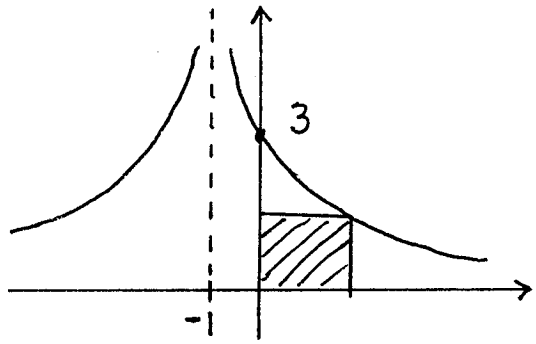
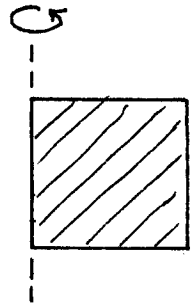
Applied Maximum/Minumum Problems

1.) Determine the dimensions and area of the rectangle of largest area which can be inscribed in the first quadrant below the graph of $y = \dfrac{3}{(x+1)^2}$.

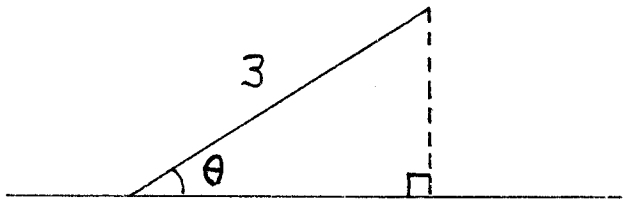


2.) An imaginary cylinder is formed by revolving a rectangle of perimeter 12 inches about one of its edges. What dimensions of the rectangle result in a cylinder of maximum volume ?



3.) The 800-room Flea Bag Motel Chain is filled to capacity when the room charge is \$50 per night. For each \$10 increase in room charge, 40 fewer rooms are filled each night. What charge per room will result in the maximum revenue per night ?

4.) Consider the given right triangle with hypotenuse 3 ft. and having angle θ. What angle θ results in a triangle of maximum area ?



5.) Find the point(s) on the graph of $x^2 - y^2 = 1$ nearest the point $(0, 2)$.

6.) Determine the dimensions of the rectangle of largest area which can be inscribed in a circle of radius 9 cm.

7.) See the map. You can swim at 2 mph and jog at 5 mph. Determine that distance x which results in the least amount of time for you to travel from point A to point B.