Math 21A
Kouba
Discussion Sheet 10

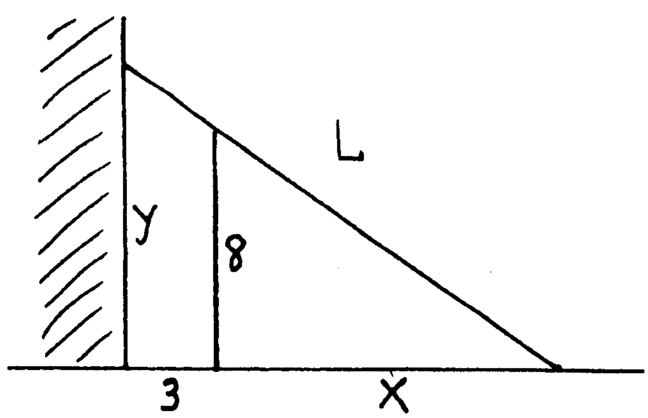
1.) An open cylindrical can is to hold 64π in.^{3} . What radius, r, and height, h, will require the least amount of material ?

2.) A farmer has 600 ft. of fencing to construct a rectangular pigpen divided into four equal-sized, parallel, rectangular sections. What dimensions will result in the largest possible total area of the pigpen ?

3.) A hiker is 6 miles directly west of a North-South road and her cabin is 10 miles North of the point on the road nearset to her. If she can walk at 4 mph off the road and at 5 mph on the road, find the least amount of time for her to reach the cabin.

4.) Find the dimensions of the rectangle of largest area which can be inscribed in a circle of radius 6 .

5.) Determine the length of the shortest ladder which will reach over an 8-ft. high fence to a large wall which is 3 ft. behind the fence.



6.) There are 100 orange trees in a grove. Each tree produces 150 oranges. For each additional ten (10) trees planted in the grove, the output per tree drops by five (5) oranges. How many trees should be added to the existing grove in order to maximize the total output of oranges ?

7.) Find the point (x, y) on the graph of $x^2 + y^2 = 1$ which is nearest the point $(4, -3)$.

8.) Find the point $P = (x, 0)$ on the x-axis which minimizes the sum of distances from $(0, 4)$ to P and from P to $(3, 2)$.

9.) Determine the height and radius of the right circular cone of minimum volume which circumscribes a sphere of radius 1.

10.) Use Newton's Method to estimate the solution to $x^3 - 2x - 5 = 0$ to 3 decimal places.

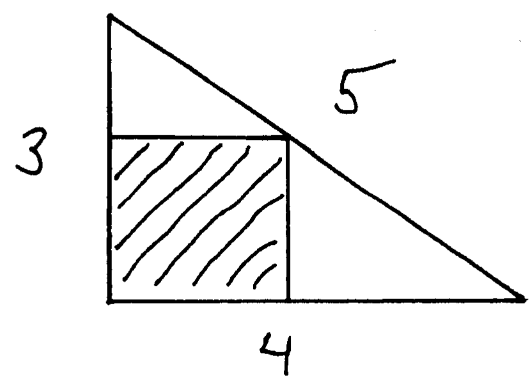
11.) Use Newton's Method to estimate $(25)^{1/4}$ to 3 decimal places.

12.) Use Newton's Method to estimate the solution to $\tan x = 4 - x$ on the interval $[0, \pi/2]$ to 3 decimal places.

13.) Use Newton's Method to estimate the value of $\sqrt{5}$ to 3 decimal places. (HINT: Solve $x^2 - 5 = 0$.)

14.) The graphs of $y = e^x$ and $y = 2 + x$ intersect at two points. Use Newton's Method to estimate the value of each point of intersection to 3 decimal places.

15.) Determine the dimensions of the rectangle of maximum area which can be inscribed in the following right triangle.



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The following problem is for recreational purposes only.

16.) Consider a room that is 30 feet long with end walls 12 feet by 12 feet. A spider sits in the middle of one end wall 1 foot below the ceiling and a fly sits in the middle of the the other end wall 1 foot above the floor. Determine the shortest walking distance from the spider to the fly.

"I intend to live forever. So far so good."- Steven Wright