Math 21A
Kouba
Discussion Sheet 6

1.) Let $f(x) = \dfrac{3x^2}{x-4}$. Determine the domain, range, x- and y-intercepts, and all vertical, horizontal, and tilted asymptotes for f . Find all relative and absolute extrema and inflection points. List the intervals on which f is increasing, decreasing, concave up, and concave down and sketch a graph of f .

2.) Write a formula for a function f which has the following five properties.
   a.) f has exactly one horizontal asymptote.
   b.) f has exactly two vertical asymptotes.
   c.) f has at least two x-intercepts.
   d.) f has at least one relative (or absolute) extrema.
   e.) f has at least one point of inflection.

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

4.) 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 ?

5.) 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.

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

7.) 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.
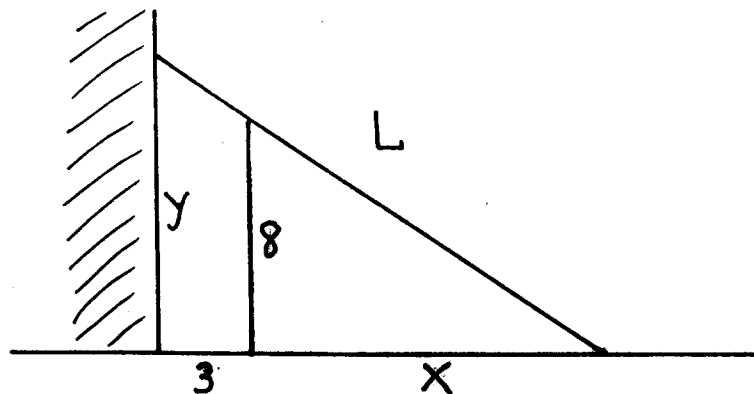
8.) There are 50 apple trees in an orchard. Each tree produces 800 apples. For each

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 ?

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

10.) 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 $(3, 2)$.

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The following problem is for recreational purposes only.

11.) Try to figure out what this "continued fraction" is equal to :

$$1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cfrac{1}{1 + \cdots}}}}}$$