1. You are given **300** meters of floating rope to enclose a rectangular swimming area. The rope is required on only three sides. Determine the dimensions x and y which result in the largest swim area. What is the maximum area? You must (a)give the function to be maximized, (b) give the constraint equation and (c) use calculus to complete the problem.

2. A store has been selling skateboards at the price of **\$45** per board, and at this price, skaters have been buying **55** boards a month. The owner of the store wants to raise the price and estimates that for each **\$3** increase in price, **4** fewer boards will be sold each month. Each board costs the store **\$35**.
   (a) Find the linear demand function that gives p as a function of q.
   (b) Find the profit function as a function of q the quantity sold.
   (c) At what price p should the store sell the boards in order to maximize profit?

3. For $f(x) = x^4 - 5x^2 + 4$ use $f''(x)$ to determine the concavity at $x = 2$

4. For $f(x) = \frac{1}{12}x^4 - \frac{1}{6}x^3 - 3x^2$ find the locations of any inflection points.

5. $f(x) = \frac{1}{9}x^9 - x + 25$ has critical points at $x = 1$ and $x = -1$
   Use the first derivative test to determine what kind of critical point at $x = -1$

6. $f(x) = \frac{1}{9}x^9 - x + 25$ has critical points at $x = 1$ and $x = -1$
   Use the second derivative test to determine what kind of critical point at $x = +1$

7. $f(x) = 2x^2 - 4x + 5$, where $0 \leq x \leq 6$. Determine the locations and values of the absolute maximum and minimum for f(x). Organize your work in a table.

8. For some $f(x)$, $f'(x) = 4x^3 + 18x^2 - 48x$, determine where the graph of $f(x)$ is concave up and where it is concave down.

9. For some $f(x)$, $f'(x) = \frac{(x^2-2x)}{(x-4)}$. Determine where the graph of $f(x)$ is increasing, and where it is decreasing.

10. Graph the function $f(x) = 1 + \frac{x}{(1+x)^2}$ doing the following:
    1. ask what you already know in general about the function.

2. find the y-intercept.
3. find all x-intercepts.
4. find all critical numbers.
5. find all critical points.
6. use the second derivative test to determine what kind of critical points.
(You can also use the first derivative test but the second derivative test is often easier and faster.)
7. find all inflection points.
8. find the left and right end-behavior of the function:
as $x \to -\infty \quad f(x) \to ?$
as $x \to +\infty \quad f(x) \to ?$
note: for rational functions $f(x)$ will either approach $+/-\infty$ or a number that is a horizontal asymptote.
9. find all vertical asymptotes and determine the functions behavior on each side of each vertical asymptote.
10. use all of the above to make a graph.