

Worksheet for February 15, 2008

1. Suppose $y = \frac{x^2 + 1}{x^2}$

- Is the function even/odd/neither? Prove your answer
- Find the expression's dominant terms. Indicate WHEN each term is dominant.
- Find y' and y'' and make a chart for each. Indicate the extrema and inflection points.
- Are there HA? VA? OA? Prove your answers
- Find the y value for each critical value.
- Use all of the information above in order to draw an accurate graph. Label important points.

2. Find the following limits. (Give proof of each.)

a. $\lim_{x \rightarrow \infty} \frac{3x^2 + x + 5}{2x^3 + 3x^2}$

b. $\lim_{x \rightarrow \infty} \frac{x^2 + \cos^2 x}{4x^2 - 2x}$

c. $\lim_{x \rightarrow \infty} \frac{7x^3 + 3x^2 + 5x}{4 + 2x}$

- The sum of 2 non-negative numbers is 10. If the product of the two numbers is to be as large as possible, what are the numbers?
- I wish to build pens for five dogs out of 240 feet of fence. I'll build the pens adjacent to each other against the house, so one side doesn't need fencing. What dimensions will give the dogs the most room to roam?
- Suppose that I am building a window with a rectangular base and a semi circle at the top. I want to maximize the light that comes through the window. What should be the dimensions of the window if the perimeter is fixed?
- I would like to estimate the $\sqrt[3]{7.8}$ using linearization.
 - what does it mean to linearize a function?
 - Where would you center this linearization?
 - Where would the center be if you wanted to find $\sqrt[3]{1.2}$?
 - Draw a picture that illustrates the linearization for $\sqrt[3]{7.8}$
 - Find the linearization and estimate the value of $\sqrt[3]{7.8}$. Check on your calculator to see if you are close. How much error is there in your approximation (use 5 decimal places).
- Given the function $y = x^7 - 4x^2 + 3x$, estimate the change in y which would result from a change in x from 1 to 1.1.
- I want to find the intersection of the curve $y = x^3 + 5x$ and the line $y = -5$. Explain the process you would use. Make a good guess for x_0 and use NM to find x_1

$$\frac{f(g(x)) - f(g(x_0))}{g(x) - g(x_0)} \cdot \frac{g(x) - g(x_0)}{x - x_0}$$

~~Handwritten scribbles~~ $\cdot f'(g(x_0)) \cdot g'(x_0)$
