Math 113
Exam 3
Due Beginning of Class Aug 13

1) The extreme value theorem guarantees that a continuous function on a closed interval has both a maximum and minimum value.

   Determine the absolute extrema of $f(x) = x^2 + 2x - 4$ on $[-2, 2]$

2) For $f(x) = (x^2 - 1)^{\frac{2}{3}}$. Locate all of the critical numbers. Build a table to help find the open intervals which the function is increasing or decreasing.

3) For $f(x) = \dfrac{x}{\ln x}$. Find all the relative extreme. Use the second derivative test to determine if the extrema are maximum or minimum values.

4) Find the following limits

a) $\lim\limits_{x \to -\infty} \dfrac{x}{\sqrt{2x^2 + 1}}$

b) $\lim\limits_{x \to -\infty} \dfrac{-2x}{6x + 1}$

c) $\lim\limits_{x \to -\infty} 4 + 5e^x$

5) Consider the following function $f(x) = \dfrac{3x^3}{x^2 - 9}$

a) Determine the domain of the function.

b) Find all Vertical asymptotes:

c) Find the Horizontal Asymptotes (Take the $\lim_{x \to -\infty} f(x), \lim_{x \to \infty} f(x)$)

d) Locate the critical Points

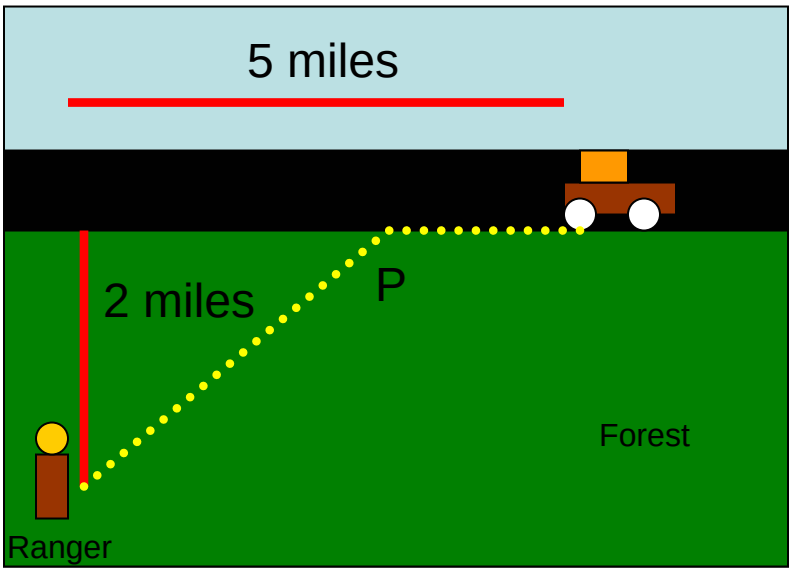
e) Locate the possible inflection points

f) Build a table to determine the open intervals when the function is increasing or decreasing

g) Build a table to determine the open intervals when the function is concave up or concave down.

h) Use the information above to sketch a graph of the function

6) A forest ranger is in a forest 2 miles from a straight road. A car is located 5 miles down the road. If the forest ranger can walk 3 miles per hour in the forest and four miles per hour along the road, toward what point P on the road should the ranger walk in order to minimize the time needed to walk to the car?



6) Use Differential to approximate the value of $\sqrt[3]{37}$