MAT 250 – SPRING 2010
Calculus 1

Murray State University
Murray, KY 42071

Problem Set 4
Due April 12, 2010

Name : ______________________________

1. The cube root of 27 is 3. How much larger is the cube root of 27.2? Estimate using the Linear Approximation

2. Find the maximum and minimum values of the function $y = -x^2 + 10x + 43$ on the interval $[3, 8]$.

3. The following questions refer to Figure 1 which gives the graph a function $f(x)$ on $[0, 8]$.

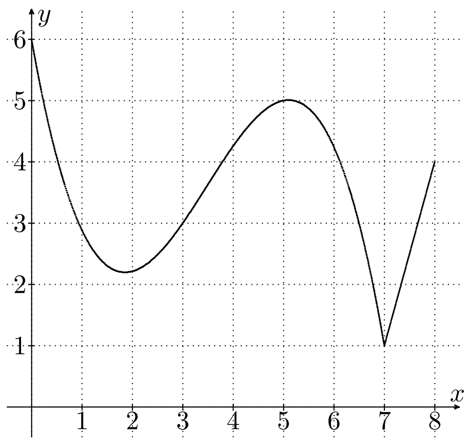

Figure 1:

   (a) How many critical points does $f(x)$ have?

   (b) What is the maximum value of $f(x)$ on $[0, 8]$?

   (c) What are the local maximum values of $f(x)$?

   (d) Find a closed interval on which both the minimum and maximum values of $f(x)$ occur at critical points.

   (e) Find an interval on which the minimum value occurs at an end point.

4. Find the critical points and the intervals on which the function is increasing or decreasing, and apply the First Derivative Test to each critical point.

$$f(x) = x - \ln x, \qquad x > 0$$

5. Find the intervals on which f is concave up or down, the points of inflection, and the critical points, and determine whether each critical point corresponds to a local minimum or maximum (or neither).

$$f(x) = x^3(x - 4)$$

6. The graph of $f'(x)$ on $[-1.7, 2.2]$ is given in Figure 2.

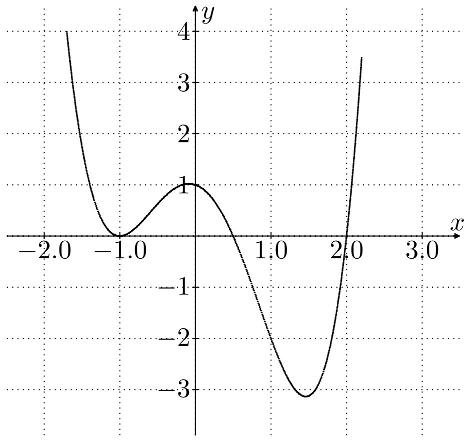

Figure 2:

   i) Determine the intervals on which f is decreasing.

   ii) Determine the intervals on which f is concave up.

   iii) Determine the critical points, classifying each as a local maximum, minimum or neither.

   iv) Determine the inflection points.

7. Calculate the following limits (Do not use L'Hopital's Rule):

   (a) $\lim_{x\to\infty} \dfrac{20x+8}{3x-9}$

   (b) $\lim_{x\to-\infty} \dfrac{x^3+4}{12x-6}$

   (c) $\lim_{x\to\infty} \dfrac{8x^2+5}{3x^4-11}$

8. Use L'Hopital's Rule to calculate the following limits:

   (a) $\lim_{x\to 1} \dfrac{2x^3+x^3-3}{x^2-1}$

   (b) $\lim_{x\to 0} \dfrac{x^3}{1-\cos x}$

   (c) $\lim_{x\to\infty} \dfrac{x^2}{e^x}$

   (d) $\lim_{x\to-\infty} \dfrac{\ln(x^4+1)}{x}$