**CALCULUS AND ANALYTIC GEOMETRY I - MAT 250**

**FALL 2008 - Review 4**

**No. I. True** or **False** problems testing basic concepts.

**No. II.** One optimization problem from the class handouts

**No. II.** Find the maximum and minimum values of the function on the given interval.

- $y = -x^2 + 10x + 43, \qquad [3, 8]$

- $y = x^5 - x, \qquad [0, 2]$

**No. IV.** For the function $f(x) = x^3 - 27x - 20$, find the critical points and the intervals on which the function is increasing or decreasing, and determine whether each critical point is a local maximum or minimum or neither.

**No. V.** Find the critical points of $f(x) = x^5 - x^3$ and use the Second Derivative Test (if possible) to determine whether each corresponds to a local minimum or local maximum.

**No. VI.** Find the intervals on which $f(t) = \sin^2 t$ for $0 \le t \le \pi$ 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).

**No. VII.** The graph of $f'(x)$ on $[-1.7, 2.3]$ is given in Figure 1.

- Determine the intervals on which $f$ is decreasing.

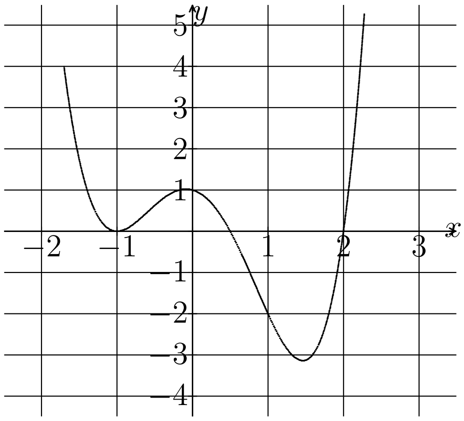


Figure 1:

- Determine the intervals on which $f$ is concave up.

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

- Determine the inflection points.

**No. VIII.** Evaluate the limits

- $\lim_{x\to 1} \frac{\sqrt{8+x} - 3x^{\frac{1}{4}}}{x^2 + 3x - 4}$

- $\lim_{x\to 1} \tan\left(\frac{\pi x}{2}\right) \ln x$

- $\lim_{x\to 1} \tan\left(\frac{\pi x}{2}\right) \ln x$

- $\lim_{x\to\infty} \left(\frac{1}{x^2} - \csc^2 x\right)$

**No. IX.** Sketch the graph of a function $f(x)$ satisfying all of the given conditions.

- $f'(x) > 0$ for all $x$ and
- $f''(x) < 0$ for $x < 0$ and $f''(x) > 0$ for $x > 0$