

Midterm Examination #3

Math 273 Calculus 1

Friday, May 7, 1999

Name _____

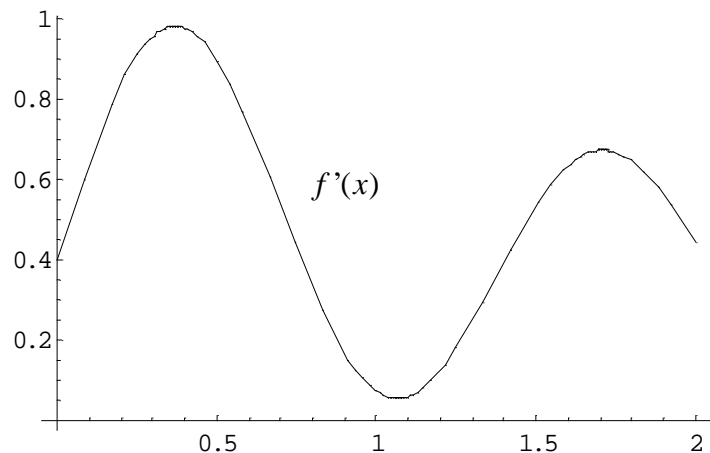
The use of graphing calculators is permitted.

§1 Computation:

- 1) Find the extrema of $f(x) = 2x - 3x^{2/3}$ on the interval $[-1, 3]$. Indicate where the function is increasing, and where it is decreasing.
- 2) Determine the open intervals on which the function $f(x) = x^4 - 8x^3 + 18x^2$ is concave upward or concave downward. Find all of the points of inflection
- 3) Evaluate the limits
 - a) $\lim_{x \rightarrow \infty} \frac{5x}{x^2 + 3}$
 - b) $\lim_{x \rightarrow \infty} \frac{8}{4 - e^{-x/2}}$
 - c) $\lim_{x \rightarrow \infty} \frac{2x + 1}{\sqrt{x^2 - x}}$
- 4) Analyze the graph of $f(x) = \frac{2(x^2 - 9)}{x^2 - 4}$. In particular, find its intercepts, asymptotes, extrema, and points of inflection.

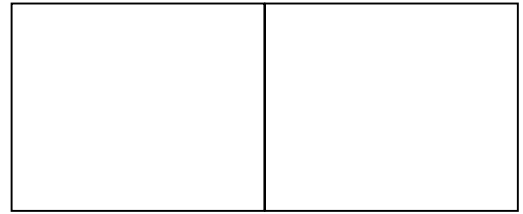
§2 Comprehension:

- 5) How do you find the global and local extrema of a function defined on a closed interval? Be complete.
- 6) The graph of the derivative $f'(x)$ is indicated. Suppose that we know that $f(0) = 0$. Explain why we know that it is not possible that $f(2) = 3$.
- 7) What is the first derivative test? What is the second derivative test? Explain why they are true.



§3 Applications:

8) A rancher has 300 feet of fence with which to enclose two adjacent, same size rectangular corrals as shown in the figure. What dimensions should be used so that the total enclosed area will be a maximum?



9) Four feet of wire is used to form a square and a circle. How much wire should be used for the square and how much should be used for the circle to enclose the maximum possible area?

10) Find the volume of the largest right circular cylinder that can be inscribed in a sphere of radius r .

