

MAT 131 Final

Fall 1997

Show all work for credit. Do all your work neatly on the paper provided. Write your name on each sheet you turn in. I will **not** grade any work done on the test sheet. When you are finished turn in all sheets including the test. Good Luck.

1. Find the piecewise definition of $f(x) = |1 - x^2|$.
2. Find the following limits:
 - a. $\lim_{x \rightarrow 2^-} \frac{x^3 - 1}{x^2 - 4}$
 - b. $\lim_{x \rightarrow \infty} x - \sqrt{x^2 + 3}$
 - c. $\lim_{x \rightarrow \infty} \frac{x - 7x^3}{2x^3 + 7x}$
3. Use the definition of the derivative to find the derivative of $f(x) = x^2 + 1$
4. In each case give an example of a function with the desired property
 - a. A function which is continuous on $(-1, 1)$ but not differentiable on $(-1, 1)$.
 - b. A function which is continuous on $(2, 3)$ but not continuous on $[2, 3]$.
5. Find the derivative of each of the given functions.
 - a. $f(x) = 2^4 x^2$
 - b. $g(x) = (1 - x^2)^4 (2x + x^3)^5$
 - c. $s(t) = \cos(\tan(x))$
6. Find $\frac{dy}{dx}$ at the point $(1, 1)$ by implicit differentiation if $x^2 y^3 = xy$.
7. Find the equation for the normal line to the curve $y = x^3 - 2x^2 + 7x - 1$ at the point $(2, 13)$.
8. A point is moving along the curve $y = 2x - 7$ in such a way that the y -value is changing at a rate of $3 \frac{ft}{sec}$. At what rate is the x -value changing.
9. Given $f(x) = x + \frac{1}{x} = \frac{x^2 + 1}{x}$
 - a. Find the intervals on which $f > 0$ and the intervals on which $f < 0$.
 - b. Find the intervals on which f is increasing and intervals on which f is decreasing.
 - c. Find the intervals on which f is concave up and intervals on which f is concave down.
 - d. Graph f (label all local max and mins).
10. Let x and y be two real numbers with the property that $3x + y = 60$. Find the pair with the largest product.