

NAME _____ TA'S NAME _____

STUDENT ID _____ SECTION _____

Math 124E, 124F
Winter 2011

Midterm 1
February 1, 2011

Point totals are indicated in parentheses. You must show your work to receive credit. You do not need a calculator for any of the problems; consequently, you will not receive credit for any solution based on calculator computations.

(6) 1. Evaluate the following limits:

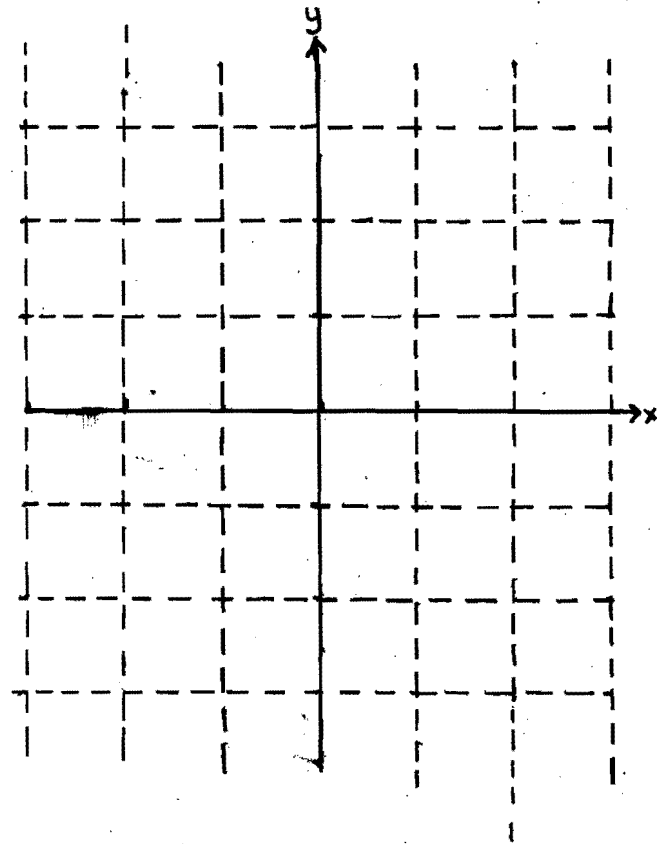
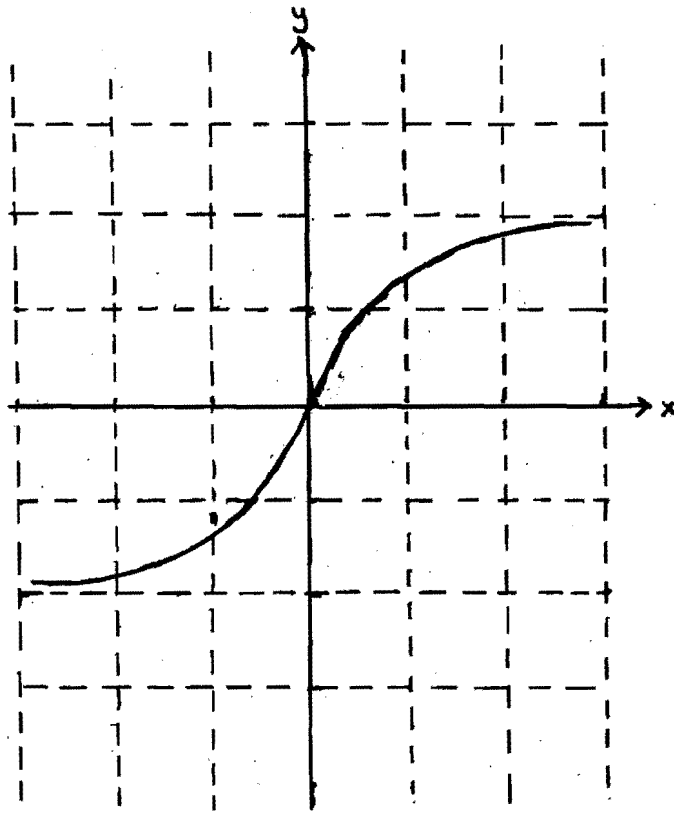
a. $\lim_{x \rightarrow \frac{\pi}{2}^+} e^{\sec x}$

b. $\lim_{x \rightarrow -\infty} \frac{\sqrt{x^2 - 9x}}{2x - 6}$

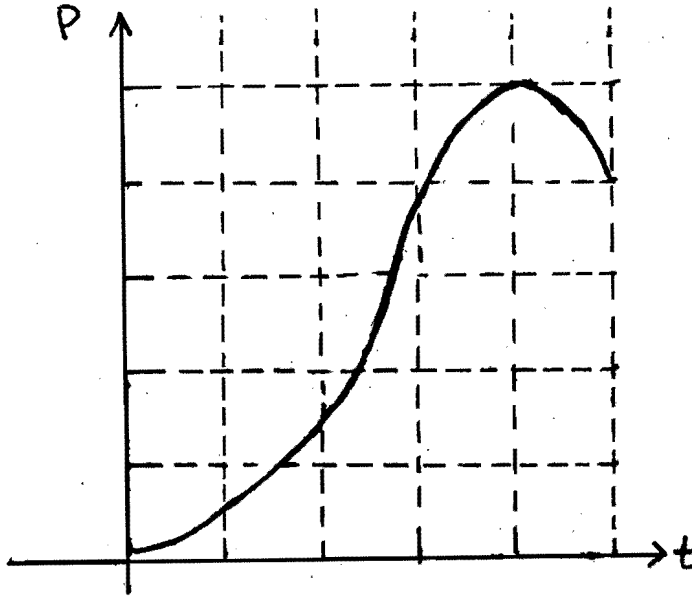
(8) 2. Consider the function $f(x) = \frac{1}{\sqrt{x^2 + 1}}$.

- a. Write down the definition of $f'(a)$, the derivative of f at a , as a limit.
- b. Evaluate this limit. (You may not use formulas you have learned from a previous calculus course.)

- (6) 3. The graph of a function f is shown below. Use this graph to estimate $f'(-2)$, $f'(-1)$, $f'(0)$, $f'(1)$, and $f'(2)$. (If any of these derivatives don't exist, explain why.) Then sketch the graph of the derivative function, f' . Be sure to indicate all the points where f' does not exist.



- (6) 4. The graph of the population of an infestation of bedbugs (in hundreds) as a function of time (in weeks) is shown below.
- What is the average rate of growth of this population between 1 and 4 weeks?
 - What is the instantaneous rate of growth of this population at time $t = 1$? (You must provide a clear justification, in words and/or drawings, for your answer.)
 - At what time is the instantaneous rate of growth of this population the greatest?



(6) 5. Find the equation of the tangent line to the curve $\frac{\sin x}{x}$ at the point $(\pi, 0)$.

- (8) 6. Find all points on the parabola $y = -x^2 + 3x + 2$ for which the line tangent to the parabola at each of these points passes through the point $(2, 13)$.