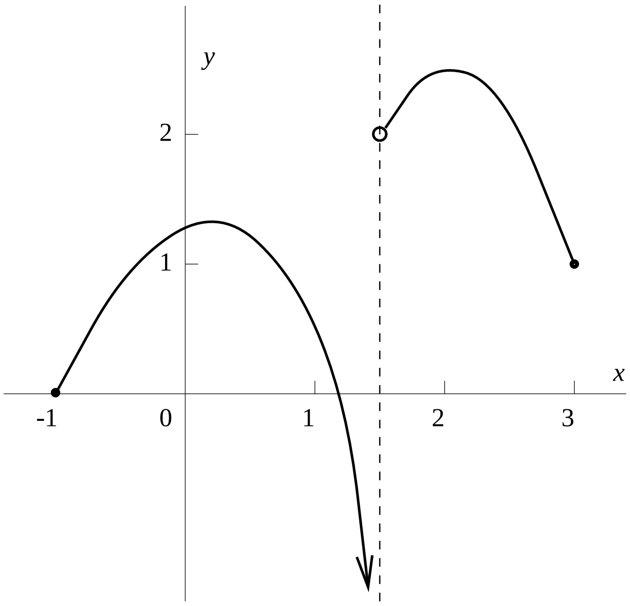
(12) 1. Below is a graph of $y = h(x)$, a function whose domain is $-1 \le x < 1.5$ and $1.5 < x \le 2$. Use this graph to answer the questions below.



y=h(x)

a) Which of the following limits exist? If they exist, what are their values? If they do not exist, explain why.

$$\lim_{x \to 1.5^-} h(x)$$

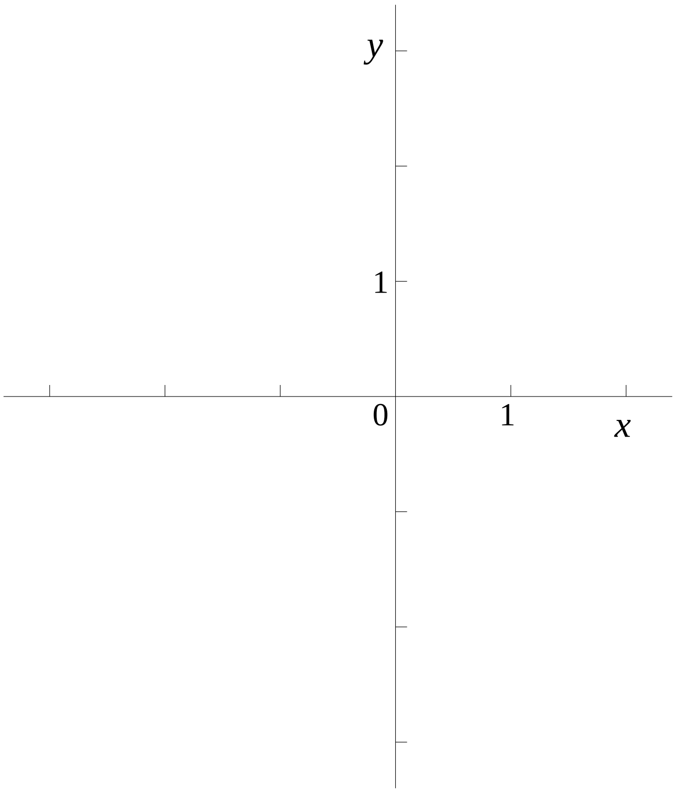
$$\lim_{x \to 1.5^+} h(x)$$

$$\lim_{x \to 1.5} h(x)$$

b) Are there any values of x where $h'(x) = 0$? If there are, what are the approximate values of $h(x)$ at these points?

(14) 2. The hyperbola $y = \dfrac{2}{x}$ and the line $y = x + 1$ intersect in two points.

- Use algebra to find the coordinates of these points.
- Sketch both curves on the indicated axes.
- Label the curves and label the coordinates of the points where they intersect.



(16) 3. Suppose that the function F is described by

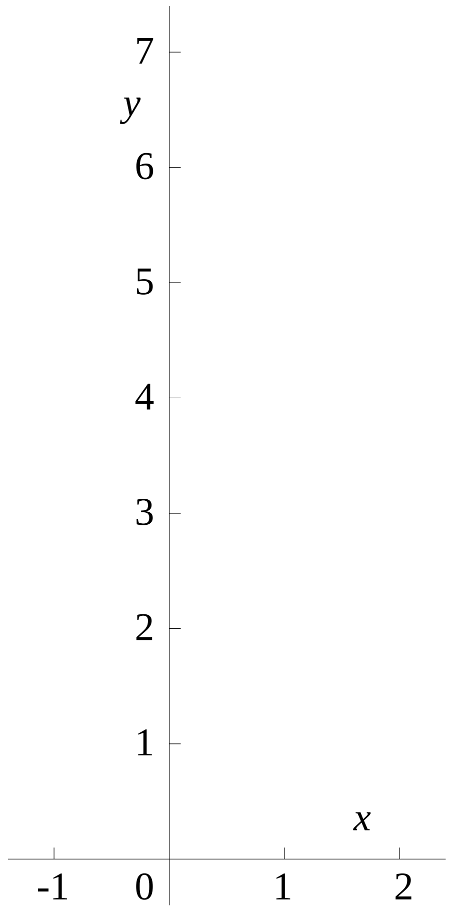
$$F(x) = \begin{cases} e^x, & \text{if } -1 \le x \le 0 \\ 3x + A, & \text{if } 0 < x \le 2 \end{cases}.$$

a) Find A so that F is continuous for all numbers in its domain. Briefly explain your answer.

b) Graph $y = F(x)$ on the axes given for the value of A found in a).

c) With the value of A found in a), is F differentiable at $x = 0$? Briefly explain your answer.

d) Suppose G is the function inverse to F with the value of A found in a). Describe G using one or more formulas: be as precise as you can with G's algebraic description and with its domain.



(20) 4. Evaluate the indicated limits exactly whenever possible. Give evidence to support your answers.

a) $\lim\limits_{x \to 3} \dfrac{x^2 - 5x + 6}{x - 3}$

b) $\lim\limits_{x \to 1} \dfrac{\frac{1}{x} - 1}{x - 1}$

c) $\lim\limits_{x \to 0^-} \dfrac{3x + \cos x}{x}$

d) $\lim\limits_{x \to 2} \dfrac{x}{x^2 - 4}$

(11) 5. a) Write the definition of derivative as a limit and *use this definition* to find the derivative of $f(x) = 5\sqrt{x}$.

b) Use your answer to a) to find an equation for the line tangent to the curve $y = 5\sqrt{x}$ when $x = 4$.

(17) 6. a) If $f(x) = -7x^8 + 3x^3 + 14$, what is $f'(x)$?

b) If $g(x) = \dfrac{x^2 - 2e^x}{5x - 3}$, what is $g'(x)$?

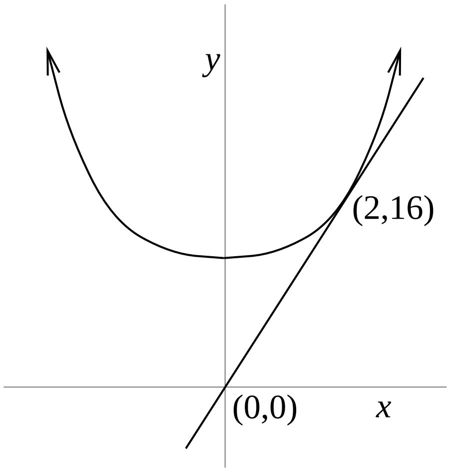
c) If $h(x) = \sqrt{x^3 - x + 1}$ what is $h'(x)$?

d) Suppose that $j(x) = k(\sin x)$ (this is a composition). The following is known about k:

$$k(0) = 3 \quad k'(0) = -4 \quad k''(0) = 5$$

Compute $j(\pi)$ and $j'(\pi)$ and $j''(\pi)$. The answers should be exact integers in each case.

(10) 7. A line passing through the origin is tangent to the graph of $y = Cx^2 + D$ at the point $(2, 16)$. Use methods of calculus to find C and D.



A A

Exam 1 for Math 135

Sections 1, 2, and 3

February 27, 1998

NAME (*please print*): ____________________

SIGNATURE: ____________________

SECTION #: ____________________

Do all problems, in any order.

Show all your work. Full credit may not be given for an answer alone.

You may use one sheet of notes and any standard calculator without a QWERTY keypad on this exam. You may use no other materials.

Problem Number	Possible Points	Points Earned:
1	12	
2	14	
3	16	
4	20	
5	11	
6	17	
7	10	
Total Points Earned:		

A A