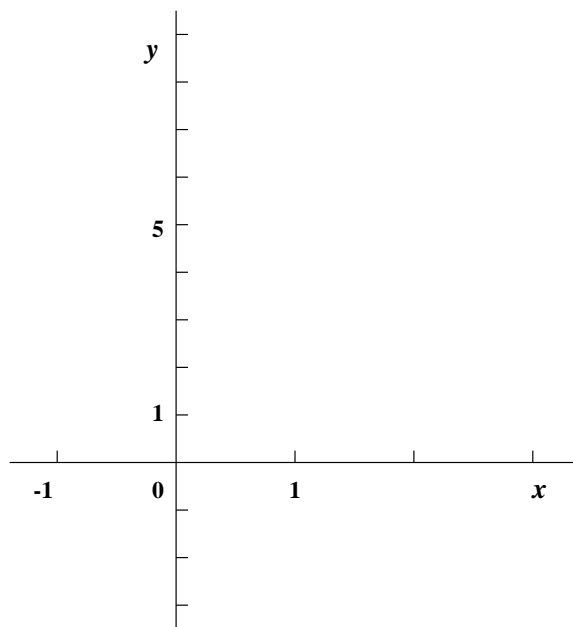


- (12) 1. a) State the formal definition of the derivative, $f'(x)$, of the function $f(x)$.
 b) Use your answer to a) combined with algebraic manipulation and standard properties of limits to compute the derivative of $f(x) = \sqrt{5x+3}$.

- (10) 2. Note that $x^2(x-2) = x^3 - 2x^2$.
 a) Find an equation for the line tangent to $y = x^3 - 2x^2$ when $x = 1$.
 b) Sketch the line found in a) and the curve $y = x^3 - 2x^2$ on the axes given below as well as you can. The units on the vertical and horizontal axes are different.



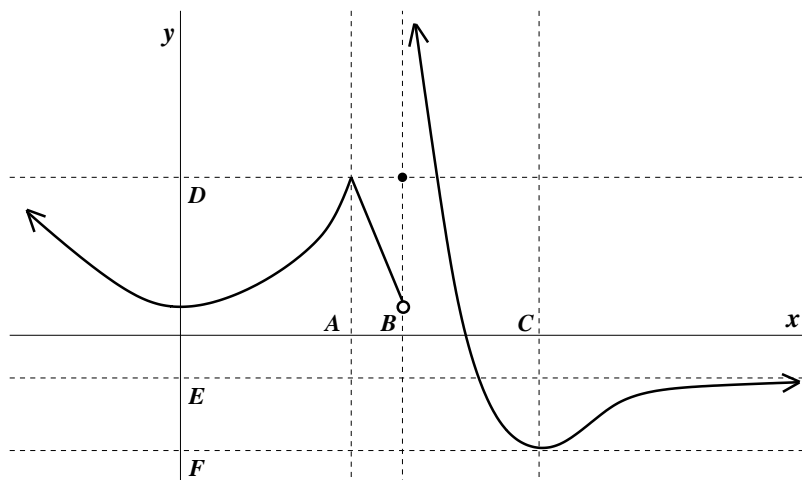
- c) For which x 's are the tangent lines to the curve $y = x^3 - 2x^2$ horizontal?
 (20) 3. Find the limit, which could be a specific real number or $+\infty$ or $-\infty$. In each case, briefly indicate your reasoning, based on algebra or properties of functions.

a) $\lim_{x \rightarrow 2} \frac{\frac{1}{2} - \frac{1}{x}}{x - 2}$ b) $\lim_{x \rightarrow 4^+} \frac{4 - x}{|4 - x|}$ c) $\lim_{x \rightarrow 10^-} \frac{1}{100 - x^2}$ d) $\lim_{x \rightarrow \infty} \frac{1}{3e^x - 2e^{-x}}$

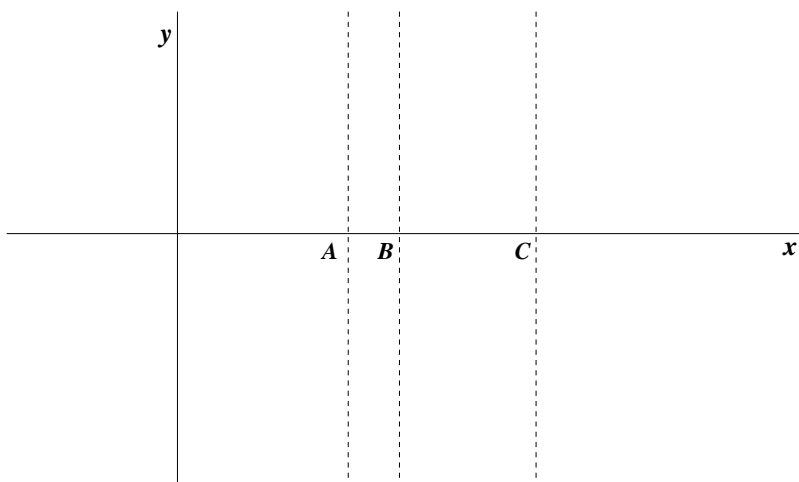
- (10) 4. Suppose $f(x) = x^2 - \frac{1}{x^3 + 12} + \sin(70x)$.
 a) There is at least one number x between 0 and 2 for which $f(x) = 0$. Explain why this is true using complete English sentences together with appropriate references to results of this course.
 b) If $x \geq 2$, $f(x)$ must be positive. Again, explain why this is true.

- (20) 5. Find $\frac{dy}{dx}$. a) $y = 4x(5x^2 - 3)^7$ b) $y = \frac{\sin(4x)}{x^2 + 1}$ c) $y = \sqrt{e^x + \cos(3x)}$ d) $x^3 + x^2y + 4y^3 = 6$

- (18) 6. Here is a graph of $y = f(x)$.



a) Use this graph to sketch a graph of $y = f'(x)$ on the axes below.



b) Are there x 's for which $f(x)$ is *not* continuous? If there are, list them.

ANSWER: _____

c) Are there x 's for which $f(x)$ is *not* differentiable? If there are, list them.

ANSWER: _____

d) Does $y = f(x)$ seem to have any horizontal asymptotes? If it does, write equations for any lines which seem to be horizontal asymptotes.

ANSWER: _____

e) Does $y = f(x)$ seem to have any vertical asymptotes? If it does, write equations for any lines which seem to be vertical asymptotes.

ANSWER: _____

(10) 7. Find all lines tangent to $y = \frac{1}{x}$ which pass through the point $(-4, 2)$.

A**A**

First Exam for Math 151
Sections 4, 5, and 6

October 13, 2003

NAME _____

SECTION _____

Do all problems, in any order.

Show your work. An answer alone may not receive full credit.

No texts, notes, or calculators may be used on this exam.

Problem Number	Possible Points	Points Earned:
1	12	
2	10	
3	20	
4	10	
5	20	
6	18	
7	10	
Total Points Earned:		

A**A**