

(20) 1. Evaluate the indicated limits exactly. Give evidence to support your answers.

a) $\lim_{x \rightarrow 2} \frac{x^2 + x - 6}{x - 2}$

b) $\lim_{x \rightarrow -2} \frac{\frac{1}{x} + \frac{1}{2}}{x + 2}$

c) $\lim_{x \rightarrow \frac{\pi}{2}^-} \frac{\sin x}{x - \frac{\pi}{2}}$

d) $\lim_{x \rightarrow 0^+} \frac{|x|}{x}$

(14) 2. a) Suppose $f(x)$ is a function. Write the **definition** of $f'(x)$, the derivative of $f(x)$, as a limit.

b) Use your answer to a) and familiar properties of limits to find the derivative of $f(x) = \sqrt{x-3}$.

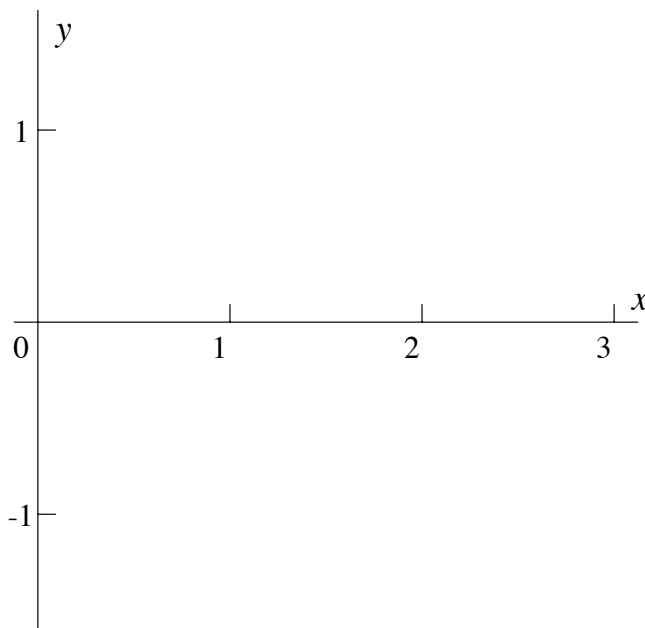
c) Use your answer to b) to write an equation for the line tangent to $y = \sqrt{x-3}$ when $x = 7$.

(14) 3. Suppose that the function G is described by

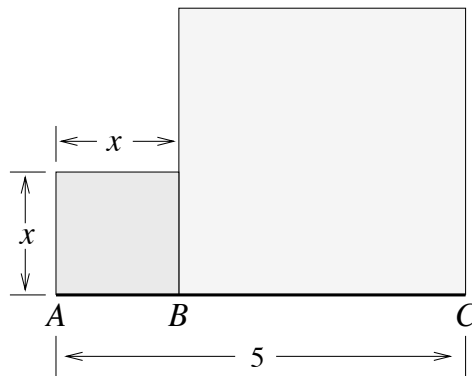
$$G(x) = \begin{cases} 1 & \text{if } 0 \leq x \leq 1 \\ Ax^2 + B & \text{if } 1 < x \leq 2 \\ x - 3 & \text{if } 2 < x \leq 3 \end{cases} .$$

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

b) Graph $y = G(x)$ on the axes given for the values of A and B found in a).

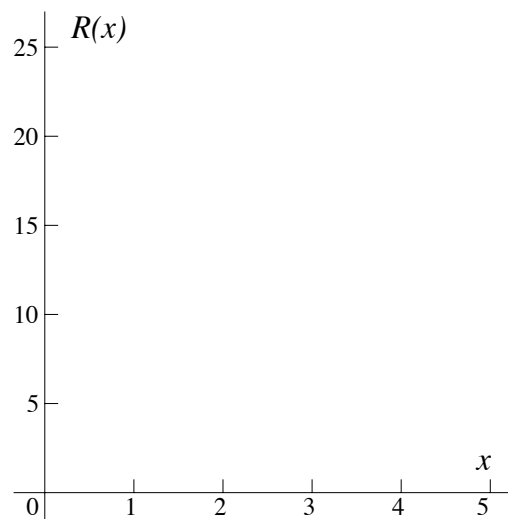


- (16) 4. The line segment \overline{AC} is 5 units long and is divided into two parts by the point B . Suppose that x is the length of the segment \overline{AB} and that $R(x)$ is the sum of the areas of the two squares with sides \overline{AB} and \overline{BC} as shown.



- a) Write an algebraic formula for $R(x)$ as a function of x .

- b) Graph $R(x)$ on the axes shown. Note that the horizontal and vertical axes have different scales.



- c) Use algebra to find all exact values of the length x for which $R(x) = 17$.

(9) 5. Use all differentiation rules here. Please do *not* simplify the answers in this problem!

a) If $P(x) = 6x^5 - 3x^3 + 4$, what is $P'(x)$?

b) If $Q(x) = \frac{x^3 + 1}{3x - 2}$, what is $Q'(x)$?

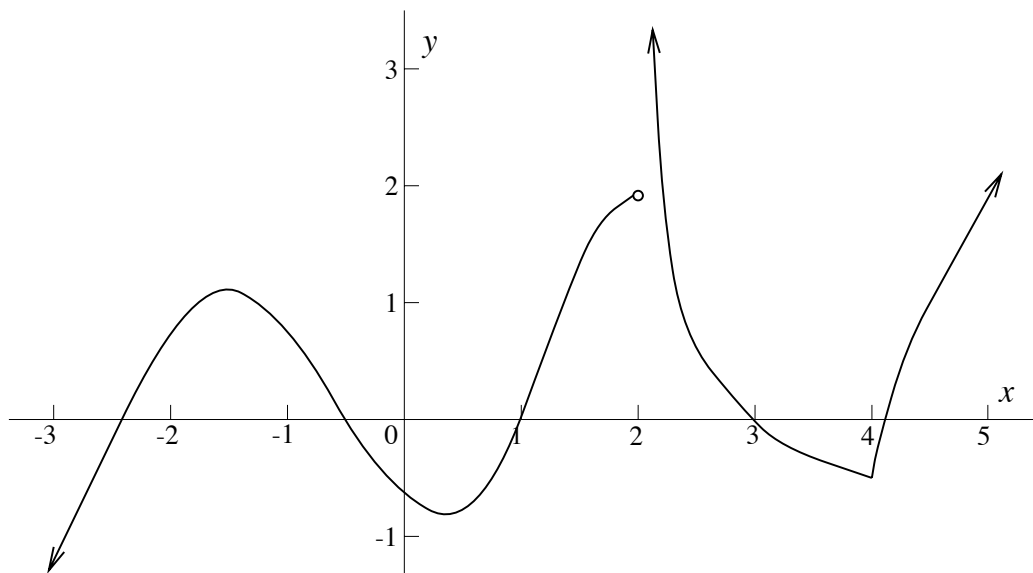
c) If $R(x) = (5 + \cos x)^{100}$, what is $R'(x)$?

(8) 6. Suppose that T is a differentiable function and the following facts are known about T and its derivatives:

$$T(5) = 0 \text{ and } T'(5) = -3 \text{ and } T''(5) = 2.$$

Suppose that $S(x) = e^{T(x)}$ (this is a composition). Compute $S(5)$ and $S'(5)$ and $S''(5)$. Give the exact answer in each case.

- (19) 7. Below is a graph of the function F . The domain of F is all numbers not equal to 2.



The graph of $y = F(x)$

Use this graph to answer the questions below as accurately as possible.

- a) For which x is $F(x) = 0$?

ANSWER _____

- b) For which x is $F(x) > 0$?

ANSWER _____

- c) What is $\lim_{x \rightarrow 2^-} F(x)$?

ANSWER _____

- d) What is $\lim_{x \rightarrow 2^+} F(x)$?

ANSWER _____

- e) For which x (in its domain) is F not differentiable?

ANSWER _____

- f) For which x is $F'(x) = 0$?

ANSWER _____

- g) What is $F(x)$ for those x 's for which $F'(x) = 0$?

ANSWER _____

- h) For which x is $F'(x) > 0$?

ANSWER _____

A**A****Exam 1 for Math 135****Sections 8, 9, and 10**

February 23, 1999

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 or symbolic manipulation capability.****You may use no other materials.**

Problem Number	Possible Points	Points Earned:
1	20	
2	14	
3	14	
4	16	
5	9	
6	8	
7	19	
Total Points Earned:		

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