

Name: _____ Score: _____ /20

Review Assignment I
due Monday, April 25, 2005

Show all your work.

For each problem completed (with all work), you will receive 1 point (for a possible 10 points). I will randomly choose one problem to grade for a possible 10 additional points.

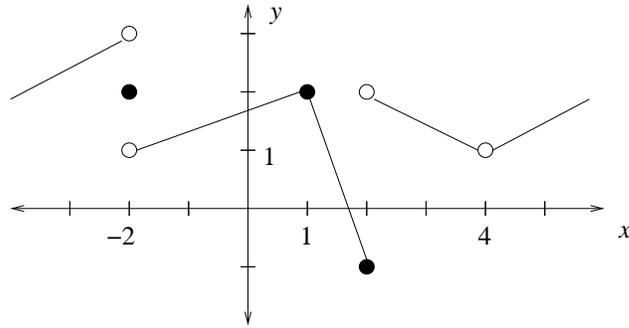
1. Find the limit if it exists, showing all work. If the limit does not exist, explain why not.

(a) $\lim_{x \rightarrow 0.5} 0.94$

(b) $\lim_{x \rightarrow 3} \frac{x - 3}{x^2 - 9}$

(c) $\lim_{x \rightarrow -1} \frac{x^2 + 2x + 1}{x^2 - 1}$

2. Consider the function f depicted below.



(a) Find each of the following (or state “does not exist”).

$\lim_{x \rightarrow -2^-} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 1^-} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 2^-} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 4^-} f(x) = \underline{\hspace{2cm}}$

$\lim_{x \rightarrow -2^+} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 1^+} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 2^+} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 4^+} f(x) = \underline{\hspace{2cm}}$

$\lim_{x \rightarrow -2} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 1} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 2} f(x) = \underline{\hspace{2cm}}$
 $\lim_{x \rightarrow 4} f(x) = \underline{\hspace{2cm}}$

$f(-2) = \underline{\hspace{2cm}}$
 $f(1) = \underline{\hspace{2cm}}$
 $f(2) = \underline{\hspace{2cm}}$
 $f(4) = \underline{\hspace{2cm}}$

(b) Answer “Yes” or “No.” (This refers to the function depicted above.)

i. Is f continuous at $x = -2$?

ii. Is f continuous at $x = 1$?

iii. Is f continuous at $x = 2$?

iv. Is f continuous at $x = 4$?

(c) TRUE or FALSE: For a function f , the value of $\lim_{x \rightarrow a} f(x)$ depends upon the value of $f(a)$.

3. Let $C(x)$ be cost, $R(x)$ be revenue, and $P(x)$ be profit, all in dollars, of producing x DVD players. Suppose that $C(1000) = 150,000$, $C'(1000) = 45$, $R(1000) = 175,000$, and $R'(1000) = 40$.

(a) Evaluate each of the following, showing your reasoning. Then interpret in a complete sentence in plain English (in terms of DVD players and dollars). *Do not use the terms "derivative" or "marginal" in your interpretation.*

i. $P(1000) =$

ii. $P'(1000) =$

(b) If the company wishes to increase its profits, should it increase or decrease the production level or let it remain at 1000? Why?

4. Find an equation of the line tangent to the graph of the function $f(x) = x^3 + 2x^2 - x + 2$ at the point where $x = -2$ by following the given steps.

(a) Find the y -coordinate of the point on the curve $y = f(x)$ where $x = -2$.

(b) Find the derivative $f'(x)$. *You may use short-cuts.*

(c) Find the slope of the tangent to the curve $y = f(x)$ at the point where $x = -2$.

(d) Find an equation of the tangent to the curve $y = f(x)$ at the point where $x = -2$. Write it in the form $y = mx + b$.

5. Let f be a differentiable function of the variable x .

(a) Give the mathematical expression which represents the y -coordinate on the graph $y = f(x)$ at the point where $x = 17$.

(b) Give the mathematical expression which represents the slope of the line tangent to the curve $y = f(x)$ at the point where $x = 17$.

(c) What equation would you solve to find the x -coordinates of all points on the curve $y = f(x)$ whose y -coordinates are 32?

(d) What equation would you solve to find the x -coordinates of all points at which the line tangent to the curve $y = f(x)$ has slope 32?

(e) What equation would you solve to find the x -coordinates of all points at which the y -coordinate is equal to the slope of the line tangent to the curve $y = f(x)$?

6. Find and simplify the derivative, $f'(x)$, for the function f given. Use the definition of the derivative (the limit of the difference quotient). *Start with the general formula and show all steps.*

$$f(x) = \frac{2}{3 - 5x}$$

$$f'(x) =$$

7. Find and simplify the derivative, $f'(x)$, for the function f given. Use the definition of the derivative (the limit of the difference quotient). *Start with the general formula and show all steps.*

$$f(x) = \sqrt{4 - 3x}$$

$$f'(x) =$$

8. Find the derivatives of the following functions. Please SIMPLIFY your answers. It might help to simplify the original function before differentiating.

(a) $f(x) = \sqrt[5]{x^4} + \frac{1}{\sqrt[5]{x^2}}$

$f'(x) =$ _____

(b) $f(x) = \frac{3}{x} + \frac{1}{3x} - \frac{1}{3}$

$f'(x) =$ _____

(c) $f(x) = \frac{1-x^2}{1+x^2}$

$f'(x) =$ _____

(d) $f(x) = \frac{1}{\sqrt{x^3-2x}}$

$f'(x) =$ _____

(e) $f(x) = x \ln x - x$

$f'(x) =$ _____

9. A company's cost function is $C(x) = 20 + 3x + \frac{54}{\sqrt{x}}$ dollars.

(a) Find the marginal cost function.

(b) Find the marginal cost at $x = 9$ and interpret your answer. (Explain what it really means in plain English.)

10. (10 points) Give all possible meanings of each mathematical expression from the list below. *You may use each letter any number of times.*

Mathematical Expression	Meaning(s) (list by letter)
$f(a)$	
$\frac{f(a+h) - f(a)}{h}$	
$\lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$	
$f'(a)$	

Possible Meanings:

- (a) the slope of a tangent line to the graph $y = f(x)$
- (b) the y -coordinate of a point on the graph $y = f(x)$
- (c) the average rate of change of f with respect to x
- (d) the slope of a secant line to the graph $y = f(x)$
- (e) the instantaneous rate of change of f with respect to x
- (f) an output of the function f