

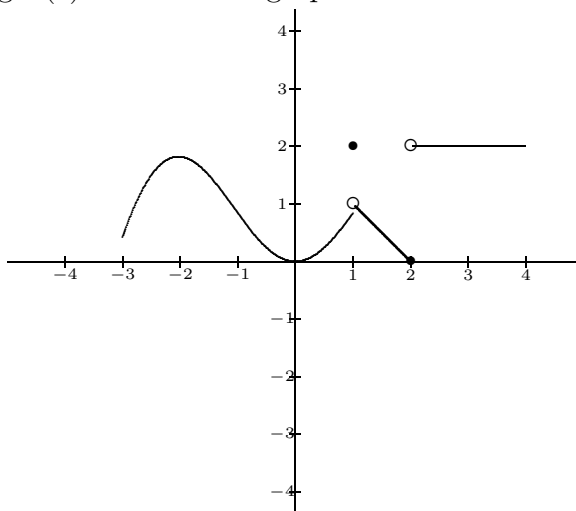
February 27, 1998

Name _____

In the first 3 problems, each part counts 8 points (total 56 points) and the final 3 problems count as marked.

Multiple choice section. Circle the correct choice. You do not need to show your work on these problems.

1. Questions (a) through (e) refer to the graph of the function f given below.



- (a) $\lim_{x \rightarrow 1} f(x) =$
 (A) 0 (B) 1 (C) 2 (D) 4 (E) does not exist
- (b) $\lim_{x \rightarrow 2^-} f(x) =$
 (A) 0 (B) 1 (C) 2 (D) 4 (E) does not exist
- (c) A good estimate of $f'(-2)$ is
 (A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate
- (d) A good estimate of $f'(-1)$ is
 (A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate
- (e) A good estimate of $f'(2)$ is
 (A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate

2. The line tangent to the graph of a function f at the point $(2, 3)$ on the graph also goes through the point $(0, 7)$. What is $f'(2)$?

- (A) -2 (B) -1 (C) 0 (D) 1 (E) 2

3. What is the slope of the tangent line to the graph of $f(x) = (2x)^{-2}$ at the point $(2, 1/16)$?

- (A) $-1/4$ (B) $-1/8$ (C) $-1/16$ (D) $-1/256$ (E) $-1/512$

On all the following questions, **show your work.**

4. (20 points) The total weekly cost in dollars incurred by the Lincoln Record Company in pressing x playing records is given by $C(x) = 2000 + 3x - 0.001x^2$ for x in the range 0 to 6000.

(a) Find the marginal cost function $C'(x)$. $C'(x) = 3 - 0.002x$

(b) Find the average cost function $\bar{C}(x)$. $\bar{C}(x) = \frac{2000+3x-0.001x^2}{x} = \frac{2000}{x} + 3 - 0.001x$.

(c) Find the marginal average cost function $\bar{C}'(x)$. $\bar{C}'(x) = -2000x^{-2} - 0.001$

- (d) Interpret your results.

The function $\bar{C}'(x) = -2000x^{-2} - 0.001$ is negative throughout its domain. This means that the average cost decreases the more records are produced.

5. (15 points) Find the following derivatives.

(a) $\frac{d}{dx}\sqrt{x^3 + 1}$

(b) $\frac{d}{dx}((2x + 1)^4 \cdot 3x^2)$

(c) $\frac{d}{dx} \frac{2x-1}{3x+2}$

6. (15 points) Let $f(x) = 1/(2x)$.

(a) Construct $\frac{f(3+h)-f(3)}{h}$

(b) Simplify and take the limit of the expression in (a) as h approaches 0 to find $f'(3)$.

(c) Use the information found in (b) to find an equation for the line tangent to the graph of f at the point $(3, 1/6)$.