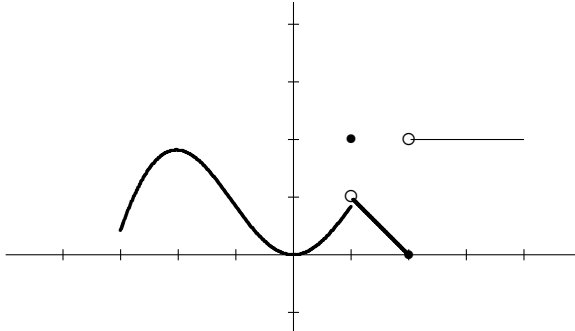


February 27, 2004

Name _____

There are 129 points available on this test. Each question is marked with its value. Multiple choice section. Circle the correct choice. You do not need to show your work on these problems.

1. (35 points) Questions (a) through (e) refer to the graph of the function f given below. Each tick mark represents one unit.



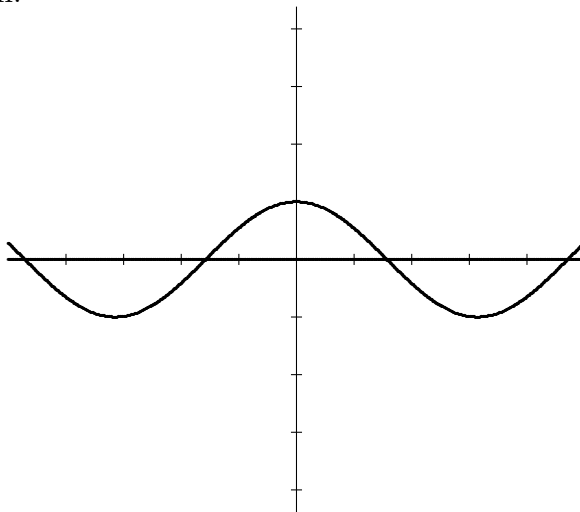
- (a) $\lim_{x \rightarrow 2^+} f(x) =$
(A) 0 (B) 1 (C) 2 (D) 4 (E) does not exist
- (b) $\lim_{x \rightarrow 2} f(x) =$
(A) 0 (B) 1 (C) 2 (D) 4 (E) does not exist
- (c) A good estimate of $f'(-2)$ is
(A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate
- (d) A good estimate of $f'(-1)$ is
(A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate
- (e) A good estimate of $f'(3)$ is
(A) -1 (B) 0 (C) 1 (D) 2 (E) there is no good estimate

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

2. (15 points) Find the derivative of the function $f(x) = 1/(x + 1)$ using the original definition of derivative.

3. (15 points) Find the derivative of the function $f(x) = \sqrt{x - 2}$ using the original definition of derivative. Then use the information to find an equation for the line tangent to the graph of f at the point $(6, 2)$

4. (10 points) The graph of function $f(x)$ on the interval $[-5, 5]$ is given. On the same set of coordinate axes, sketch the graphs of $f'(x)$ and $f''(x)$, being clear about which is which.



5. (15 points) Discuss the asymptotes of the function f defined by:

$$f(x) = \frac{(x+1)x^2(x^2-4)(2x-5)}{(x+2)x^3(4x^2-25)}$$

A. Locate and describe all vertical asymptotes.

B. Locate all horizontal asymptotes.

6. (24 points) Find each limit below if it exists. If it does not exist, state why it does not. Explain how you arrived at your answer and of course, SHOW YOUR WORK

(a) $\lim_{h \rightarrow 0} \frac{|h|}{h}$

(b) $\lim_{x \rightarrow 1} \frac{x^2 - 1}{x^3 - 1}$

(c) $\lim_{x \rightarrow -2} \frac{4x + 8}{x^2 - 4}$

(d) $\lim_{x \rightarrow \infty} \sqrt{x^2 + 6x - 3} - x$

7. (15 points) The position of a particle at time t is given by $f(t) = 3t^2 + 5t + 3$, where t is measured in seconds and $f(t)$ is measured in feet.

(a) How far does the particle travel between the time $t = 1$ and $t = 4$?

(b) What is the average speed in feet per second that the particle travels during this time interval $[1, 4]$?

(c) What is the instantaneous speed of the particle when $t = 4$?