

**Math 77**  
**Midterm 2**

Name \_\_\_\_\_

**Fall 2006**

Show your work, the right solution without explanation is useless. Be clean and organized, it is your responsibility to make yourself understood. No graphic calculators. If you did not bring your calculator, you will have to do the exam without it, sharing calculators is not allowed. Good luck!!!

1. (18 points) Find the derivative of the following functions:

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

Answer: \_\_\_\_\_

b)  $g(x) = \sin(e^x + 5x)$

Answer: \_\_\_\_\_

c)  $h(x) = \sqrt[3]{x^3 - x}$

Answer: \_\_\_\_\_

d)  $i(x) = e^x + \frac{1}{e^x} + x^e + \frac{1}{x^e}$

Answer: \_\_\_\_\_

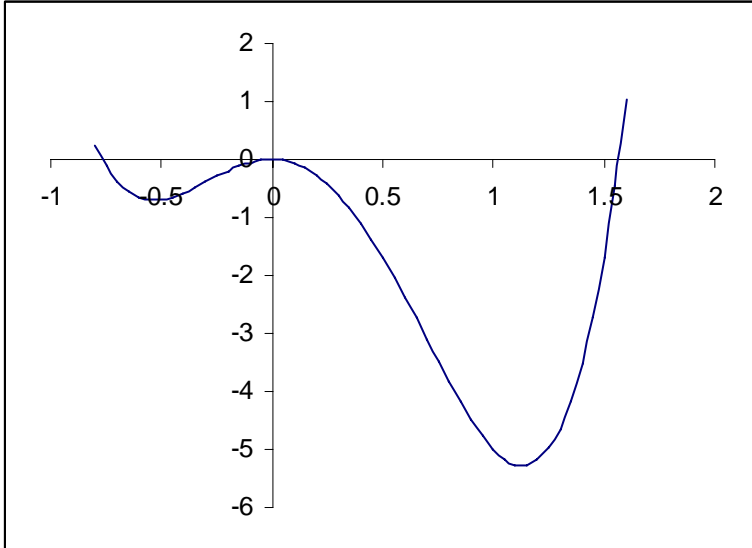
e)  $j(x) = e^x(x + 2)$

Answer: \_\_\_\_\_

f) Given  $f(3) = 4$  and  $f'(3) = 5$ , find  $g'(3)$ , where  $g(x) = \frac{x^2}{f(x)}$

Answer: \_\_\_\_\_

2. (10 points) Below is the graph of the **derivative** of the function  $f(x)$ .



a) List the critical points of  $f(x)$

Answer: \_\_\_\_\_

b) State the intervals on which  $f(x)$  is increasing

Answer: \_\_\_\_\_

c) State the intervals on which  $f(x)$  is decreasing

Answer: \_\_\_\_\_

d) Is there any point at which  $f(x)$  attains a maximum? If your answer is yes, please say at which point or points.

Answer: \_\_\_\_\_

e) Is there any point at which  $f(x)$  attains a minimum? If your answer is yes, please say at which point or points

Answer: \_\_\_\_\_

3. (24 points) Given the function  $f(x) = x^4 - 2x^2 + 2$ .
- (a) Find the derivative function  $f'(x)$ .

Answer: \_\_\_\_\_

- (b) Find the critical points of  $f(x)$ .

Answer: \_\_\_\_\_

- (c) Find the second derivative  $f''(x)$ .

Answer: \_\_\_\_\_

- (d) Use the second derivative test to decide if each of the critical points is a local maximum, minimum or if the test is inconclusive.

Answer: \_\_\_\_\_

- (e) Use the first derivative test to decide if each of the critical points is a local maximum, minimum or Inflection point.

Answer: \_\_\_\_\_

- (f) Evaluate the function  $f(x)$  at the end points of the interval  $[-2,1]$ .

Answer: \_\_\_\_\_

(g) Evaluate the function  $f(x)$  at the critical points.

Answer: \_\_\_\_\_

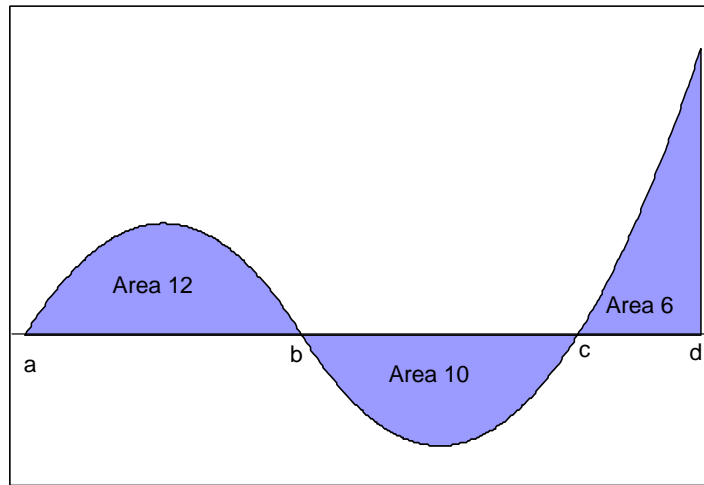
(h) Find the global maximum and the global minimum of the function  $f(x)$  on the interval  $[-2,1]$ .

Answer: \_\_\_\_\_

4. (12 points) Find the tangent line approximation for  $f(x) = \frac{5}{x}$  near  $x = 2$ . Then use it to approximate  $f(1.9)$

Answer: \_\_\_\_\_

5. (12 points) Use the graph of a function  $f(x)$  below to find the values of the following integrals and decide if the statements are True or False. Circle one.



- a)  $\int_a^b f(x)dx = 12$                       **TRUE**                      **FALSE**
- b)  $\int_a^c f(x)dx = 22$                       **TRUE**                      **FALSE**
- c)  $\int_a^d f(x)dx = 8$                       **TRUE**                      **FALSE**
- d)  $\int_b^d |f(x)|dx = 28$                       **TRUE**                      **FALSE**
- e)  $f'(b) = 0$                       **TRUE**                      **FALSE**
- f)  $f'(b) < 0$                       **TRUE**                      **FALSE**
6. (8 points) Using the table below calculate the left-hand sum and the right-hand sum to estimate  $\int_0^3 f(x)dx$ .

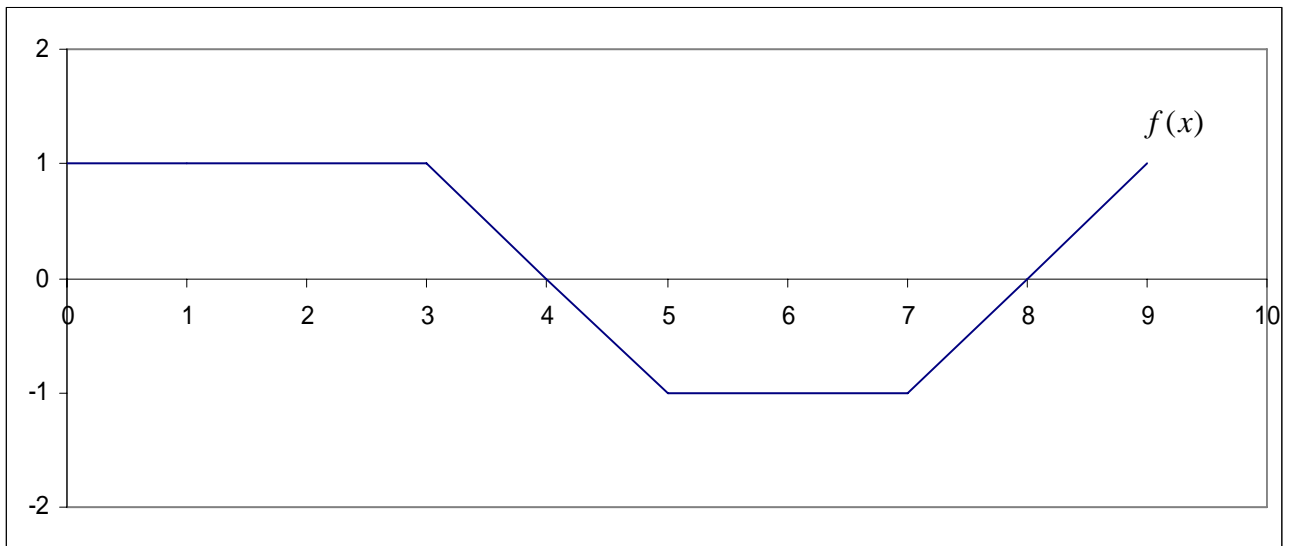
x	0	1	2	3
f(x)	7	10	21	20

Answer: \_\_\_\_\_

7. (8 points) Your velocity is  $v(t) = 3t^2 - 4$  for  $0 \leq t \leq 3$ . Find or estimate the distance travelled during this time.

Answer: \_\_\_\_\_

8. (8 points) Find the average value of the function  $f(x)$  on the interval  $[0,9]$



Answer: \_\_\_\_\_