

MIDTERM 2

FALL 2007

November, 2007

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!!!

Question	Points	Out of
1		12
2		10
3		12
4		10
5		12
6		10
7		12
8		12
9		10
Total		100

1. Let  $f(x) = 3x^5 - 20x^3 + 5$

a. (2 points) Find the first derivative function  $f'(x)$ .

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

b. (2 points) Use  $f'(x)$  to determine the critical points of  $f(x)$ .

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

c. (2 points) Determine where  $f(x)$  is increasing and decreasing.

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

d. (3 points) Use the First Derivative Test to determine if the critical points are local maxima, local minima or neither.

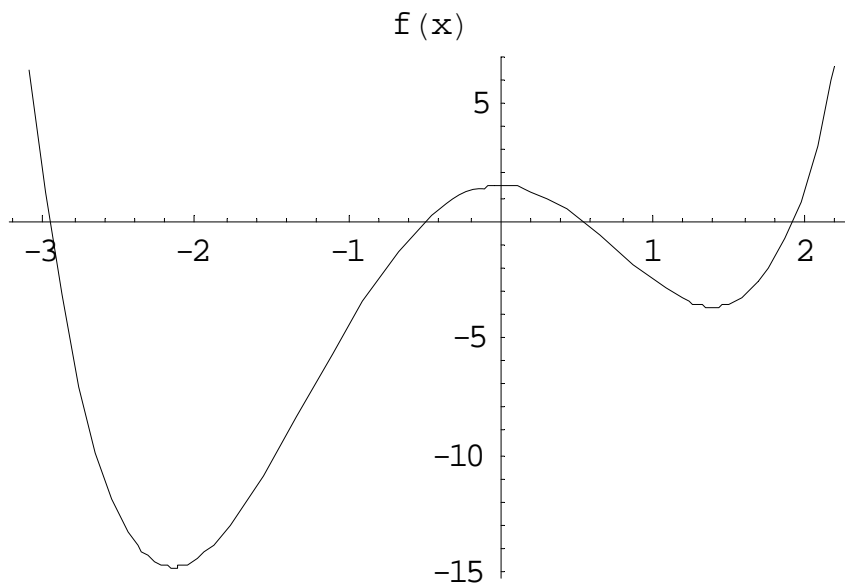
Answer:\_\_\_\_\_

- e. (3 points) Use the Second Derivative Test to determine if the critical points are local maxima or local minima. If this test is inconclusive at some point, explain why.

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

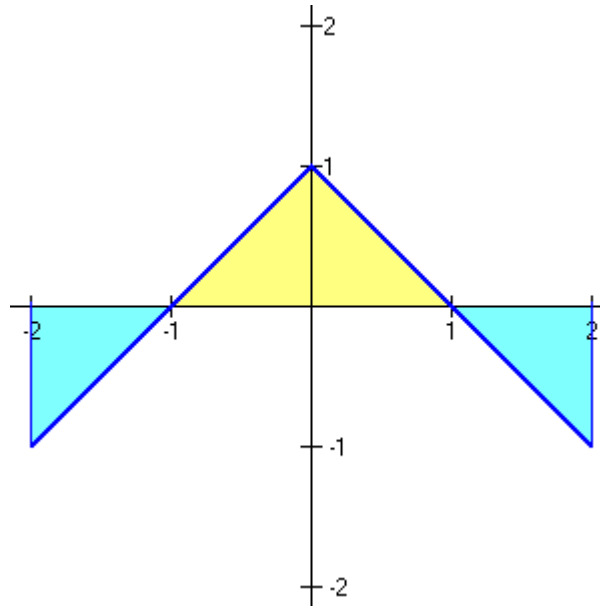
2. Using the graph of  $f(x)$  given below, list the following integrals in increasing order (from smallest to largest). Which integrals are positive, which are negative? Give reasons.

a.  $\int_{-2.9}^{1.9} f(x)dx$    b.  $\int_{-0.4}^{0.45} f(x)dx$    c.  $\int_{-0.4}^{1.9} f(x)dx$    d.  $\int_{-2.9}^{0.45} -f(x)dx$    e.  $\int_{-2.9}^{1.9} |f(x)|dx$



Order	Integral (5 points)	Sign of the integral (1 point each)
1 <sup>st</sup>		
2 <sup>nd</sup>		
3 <sup>rd</sup>		
4 <sup>th</sup>		
5 <sup>th</sup>		

3. Use the graph of  $f'(x)$  below, and the fact that  $f(1) = 3$  to answer the following questions.



- a. (2 points) What is the value of  $\int_{-2}^{-1} f'(x) dx$ ?

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

- b. (2 points) What is the value of  $\int_{-1}^1 f'(x) dx$ ?

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

- c. (2 points) What is the value of  $\int_{-2}^1 f'(x) dx$ ?

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

- d. (2 points) What is the value of  $\int_{-2}^2 |f'(x)| dx$ ?

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

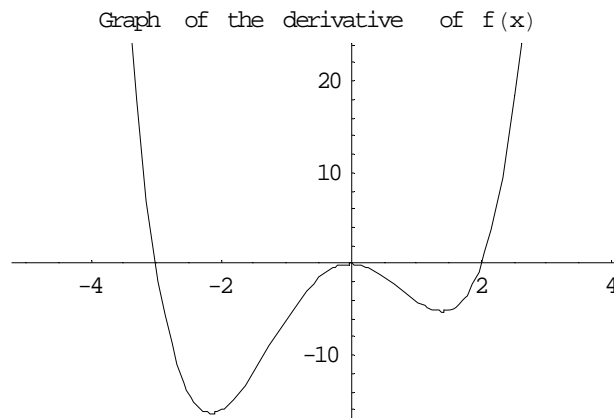
- e. (2 points) What is the value of  $f(-1)$ ?

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

- f. (2 points) What is the value of  $f(2)$ ?

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

4. Below is the graph of  $f'(x)$ , the **derivative** of the function  $f(x)$ .



- a. (2 points) List the critical points of  $f(x)$

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

- b. (2 points) State the intervals on which  $f(x)$  is increasing.

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

- c. (2 points) State the intervals on which  $f(x)$  is decreasing.

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

- d. (2 points) 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. (2 points) Is there any point at which  $f(x)$  attains a minimum? If your answer is yes, please say at which point or points

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

5. (3 points each) Use the rules for differentiation to find the derivative of each of the given functions. Do not simplify.

a.  $f(x) = 10\sqrt[3]{x^2} - \frac{1}{x^{10}}$

c.  $h(x) = \sin(x) \cdot \cos(x)$

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

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

b.  $g(x) = 5^{x^2+4x}$

d.  $i(x) = \frac{e^x}{x^2 + 1}$

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

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

6. Use the following table:

$x$	0	3	6	9	12	15
$f(x)$	50	48	44	36	24	8

a. (4 points) Use the left-hand sum to estimate  $\int_0^{15} f(x)dx$ .

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

b. (4 points) Use the right-hand sum to estimate  $\int_0^{15} f(x)dx$ .

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

c. (2 points) Use both the left-hand sum and the right-hand sum to estimate  $\int_0^{15} f(x)dx$ .

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

7. (2 points each) Evaluate each of the following definite or indefinite integrals.

a.  $f(x) = \int x^3 + 3dx$ .

d.  $\int \sqrt[4]{x^5} dx$ .

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

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

b.  $g(x) = \int \frac{1}{x^7} dx$ .

e.  $\int \sqrt[9]{\frac{4}{x^2}} dx$

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

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

c.  $h(x) = \int \frac{1}{x} dx$ .

f.  $\int \cos x dx$

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

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

8. Your velocity is  $v(t) = 4t^2 - 1$  for  $0 \leq t \leq 4$ .
- a. (4 points) Estimate the distance travelled during this time with  $\Delta t = 0.8$  seconds

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

- b. (4 points) Find the exact value for the distance traveled during this time.

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

- c. (4 points) Find the average velocity during this time.

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

9. (2 points each) True or False? Circle one.

- a. If  $f'(a) > 0$ , then  $f(x)$  is Concave Up at the point  $x = a$ .

**TRUE** or **FALSE**

- b. If  $f(x)$  has an absolute minimum at  $c$ , then  $f'(c) = 0$ .

**TRUE** or **FALSE**

- c.  $\int e^{-x} dx = e^{-x} + C$

**TRUE** or **FALSE**

d.  $\int x^{-1} dx = \frac{x^{-1+1}}{-1+1} + C$

**TRUE** or **FALSE**

e.  $\int \frac{\sin x}{\cos x} dx = \frac{1}{\cos^2 x} + C$

**TRUE** or **FALSE**