

# Math 77

## Midterm 1

Name \_\_\_\_\_

Spring 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. Decide if the following functions could be linear, exponential or neither. If linear or exponential give the possible formula.

$x$	$f(x)$	$g(x)$	$h(x)$
0	1,1	3	0
1	4,1	2,7	-3
2	7,1	2,43	-12

2. Decide if the following functions could be concave up, concave down or neither in the whole interval  $0 < x < 5$

$x$	$f(x)$	$g(x)$	$h(x)$
0	0	25	-1
1	8	52	-0,5
2	32	73	-2
3	72	88	0,5
4	128	97	1
5	200	100	1,5

3. Let  $f(x) = x^2 - 3x + 1$  and  $g(x) = x + 1$

(a) What is  $f(g(x))$ ?

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

(b) What is  $g(f(2))$ ?

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

(c) What is  $f(f(x))$ ?

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

4. Solve using logs:

(a)  $2^x = 6$

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

(b)  $5e^{-6x} = e^{4x}$

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

5. True or False? Circle one.

(a) If  $f(x)$  is increasing near  $x = 2$ , then  $f'(2)$  is positive.

**TRUE**                      **FALSE**

(b) If  $f(x)$  is concave up at  $x = 2$ , then  $f''(2)$  is negative.

**TRUE**                      **FALSE**

(c) If  $f(x)$  is concave up at  $x = 2$ , then  $f'(x)$  is increasing near  $x = 2$ .

**TRUE**                      **FALSE**

(d)  $\ln(e^x) = x$ .

**TRUE**                      **FALSE**

(e)  $e^{\ln x} = x$ , for  $x > 0$ .

**TRUE**                      **FALSE**

6. Let  $f(t) = 4t^2 - 7t + 3$ :

(a) What is the change in  $f(t)$  between  $t = 2$  and  $t = 6$ ?

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

(b) What is the average rate of change in  $f(t)$  between  $t = 2$  and  $t = 6$ ?

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

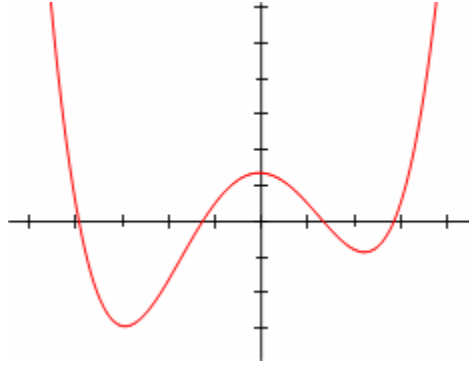
(c) Give an estimation for  $f'(2)$ , using  $h = 0.01$

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

(d) Give the exact value for  $f'(2)$  using the power rule

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

7. Below is the graph of a function  $f(x)$ . Sketch the graph of its derivative  $f'(x)$  on the same axes:



8. The population of a certain town is given by the function  $P(t)$  where  $t$  is the number of years since the town was incorporated.

(a) What does it mean to say  $P'(175) = -50$  ? (give the units)

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

(b) What does it mean to say  $P'(185) = 100$  ? (give the units)

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

(c) If  $P'(t)$  is constant for  $t \geq 185$ , what will  $P(200)$  be if  $P(185) = 25,500$  ?

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

9. Sketch the graph of a function on the interval  $[-2,6]$  with the following properties.

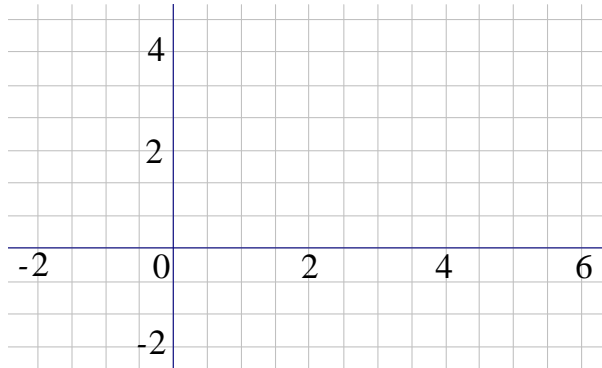
(a)  $f''(x) > 0$ , for  $-2 < x < 0$  and for  $2 < x < 4$

(b)  $f''(x) < 0$ , for  $0 < x < 2$  and for  $4 < x < 6$

(c)  $f'(x) < 0$ , for  $x < -1$  and for  $x > 5$

(d)  $f'(x) > 0$ , for  $-1 < x < 5$

(e)  $f(-1) = -2$  and  $f(5) = 4$



10. Find the derivative of

(a)  $f(x) = 3x^3 - 4x^{-3}$

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

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

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

(c)  $h(x) = \sqrt[4]{\frac{1}{x^7}}$

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

11. Consider the function  $f(x) = 3x^2 - 2x + 1$

(a) Give the equation of the tangent line to  $f(x)$  at  $x = 1$

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

(b) Estimate  $f(1.1)$  using the tangent line

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