

**Math 124 Group Worksheet (Sec. 3.2) Name \_\_\_\_\_**

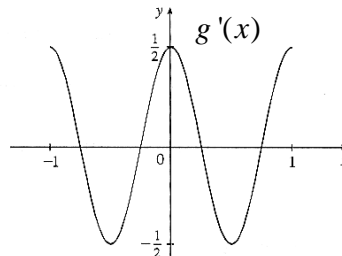
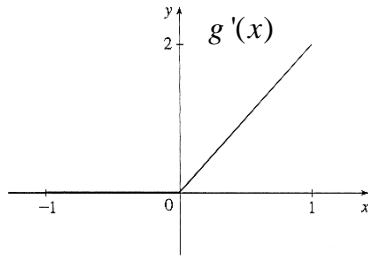
*Directions: Work in groups of 2-3. You may need extra paper.*

**1** .

Let  $g$  be a differentiable function defined everywhere with the following values

$$g(-1) = -1 \quad g(0) = 0 \quad g(1) = 0$$

The graphs of two functions are shown below. For each graph explain why it can or cannot be the graph of  $g'$ , the derivative of  $g$ .



**2** .

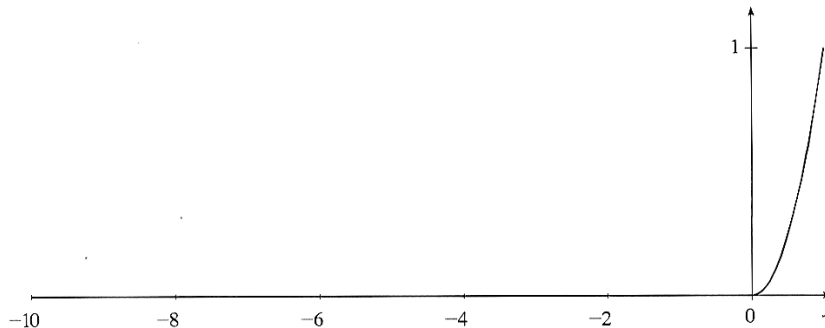
Consider the function  $f(x) = \begin{cases} -x & \text{if } x \leq 1 \\ x - 2 & \text{if } x > 1 \end{cases}$  Then  $f(0) = f(2) = 0$ . Your friend claims that by the Mean Value Theorem,  $f'(c)$  should be zero for some  $c$  with  $0 < c < 2$ .

- Find such a value of  $c$  or show why it does not exist.
- Does your answer to part (a) contradict the Mean Value Theorem? Give reasons for your answer.

**3**

(a) Let  $f$  be a function such that  $f(1) = 5$  and  $f(3) = 5$ . What additional conditions on  $f$  will guarantee that there is a point between  $x = 3$  and  $x = 5$  where  $f$  has a horizontal tangent line?

(b) Let  $f(x) = \begin{cases} 0 & \text{if } -10 \leq x < 0 \\ x^2 & \text{if } 0 \leq x \leq 1 \end{cases}$



- Show that this function is differentiable at  $x = 0$ .
- Find a value of  $c$  with  $-10 < c < 1$  for which the conclusion of the Mean Value Theorem is true.

**4**

1. Let  $f$  be a function such that  $f(0) = 2$  and  $f'(x) \leq 6$  for  $-10 \leq x \leq 10$ .

(a) What is the maximum possible value of  $f(2)$ ? What is the maximum possible value of  $f(4)$ ?

(Hint: Apply the MVT on  $[0,2]$  and  $[0,4]$ .)

(b) Can  $f(5)$  be negative? Can  $f(5)$  equal 0? Why or why not?

(c) Can  $f(5)$  equal 31? Can  $f(5)$  equal 34? Why or why not?

2. Let  $g(x) = 4x + 9$ . Find the values of  $x \geq 0$  for which  $f(x)$  can be less than  $g(x)$ . Find the values of  $x \geq 0$  for which  $g(x)$  can be less than  $f(x)$ .