

MONTGOMERY COLLEGE  
Department of Mathematics  
Rockville Campus

MA 160 Dr. Katiraie

Sections 2.3 – 2.4 (20 POINTS)

$$f'(a) = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h} \qquad f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a}$$

1. To find the derivative of the function  $f(x) = x^2 - 8x + 9$  at  $x=2$   
(4 points)

a. Find  $f(2)$

b.  $f(2+h)$

c. Find the average rate of change  $\frac{f(2+h) - f(2)}{h}$  and simplify

d. Take the limit as  $h$  approaches 0

2. Use any of the definitions of derivatives (provided on top of this page) to find the instantaneous rate of change of function

$f(t) = t^2$  at  $t = 7$  (2 points)

3. Use any of the definitions of derivatives (provided on top of this page) to find the instantaneous rate of change of function

$f(x) = 7x^2 - x$  at  $x = 3$  (2 points)

4. Suppose it starts snowing at 6 PM. Interpret each of the following, where  $H(t)$  is the height of snow in inches as a function of time  $t$  in hours after 6 PM. (5 points)

(a) $H(6)=4$	(b) $H'(6)=1.5$
(c) $H(20)=13$	(d) $H'(20)=0$
(e) $H'(23)<0$	

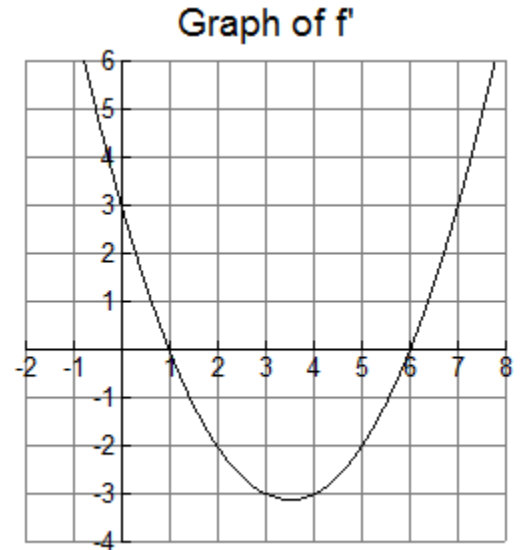
5. Let  $h(t)$  be a person's height in inches at age  $t$  years. Write a sentence, using appropriate units, explaining the meaning of each of the following. (2 points)

(a)  $h(12)=56$

(b)  $h'(12)=2.5$

6. **Using the Graph of the Derivative:** The graph shown is the graph of  $f'$ , the **derivative** of a function  $f$ . Note that the graph of  $f$  is not shown. If the function  $f$  is defined for all  $x$ , use this graph to answer the following questions. (5 points)

- a. On what interval(s) is the function  $f$  increasing?
- b. On what interval(s) is the function  $f$  decreasing?
- c. At what value(s) of  $x$ , if any, does  $f$  have a local maximum?



- d. At what value(s) of  $x$ , if any, does  $f$  have a local minimum?
- e. Suppose it is also known that  $f$  goes through the point  $(0,0)$ . Based on all of the above information, sketch a possible graph of the function  $f$ .

