

## The derivative as a function.

1. Let  $f(x) = x^2$ . Find the following derivatives algebraically.

(a) Find  $f'(5)$

(b) Find  $f'(122)$

(c) Find  $f'(a)$ .

$f'$  is a **function**:

input = 5, output = \_\_\_;    input = 122, output = \_\_\_;    input =  $a$ , output = \_\_\_.

So we write  $f'(x) = \underline{\hspace{2cm}}$ .

2. (a) Let  $f(x) = 5x + 3$ . Find its derivative  $f'(x)$  algebraically.

(b)  $f'(28) = \underline{\hspace{2cm}}$ ;

$f'(0) = \underline{\hspace{2cm}}$ ;

$f'(-8) = \underline{\hspace{2cm}}$ .

Does this make sense? (Think about the graph of  $f$  and its slope.)

3. Differentiate  $f(x) = 1/x$  algebraically.

4. (a) Suppose the graph of a function  $g(x)$  is as shown below. Sketch a graph of its derivative  $g'(x)$ .

(b) On which intervals is  $g$  increasing?  
What do you notice about  $g'$  on these intervals?

(c) On which intervals is  $g$  decreasing?  
What do you notice about  $g'$  on these intervals?

(d) On which intervals is  $g$  constant?  
What do you notice about  $g'$  on these intervals?

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5. Which of the following is correct?

$$f'(a) = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} \quad \text{OR} \quad f'(a) = \lim_{b \rightarrow a} \frac{f(b) - f(a)}{b - a} \quad \text{OR} \quad f'(a) = \lim_{h \rightarrow 0} \frac{f(a + h) - f(a)}{h}$$

Explain your answer.

### ANNOUNCEMENTS

Homework, due Wednesday, 10/07/98: HH, section 2.3 : 16, 22, 25, 26, 30, 31.  
Functions Gateway exam: Thursday 10/08, in Lab.