

### Class Drill 4: Representations of Slopes

In Section 3-4 of the textbook, you learned about average rate of change and instantaneous rate of change.

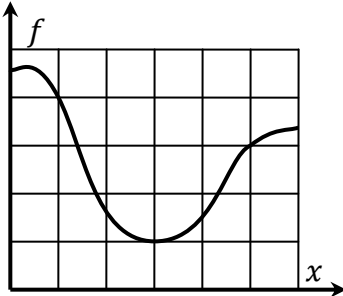
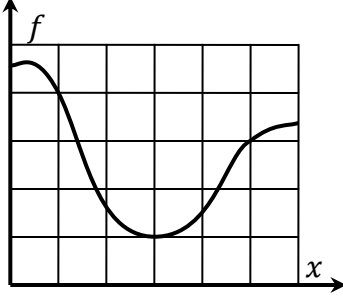
#### **Definition of Average Rate of Change**

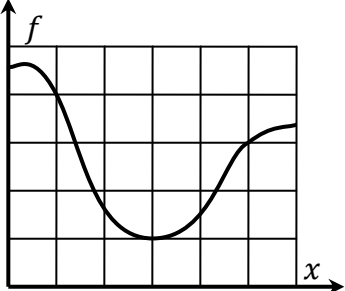
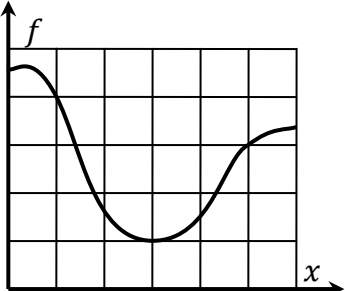
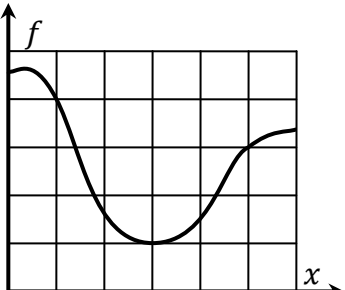
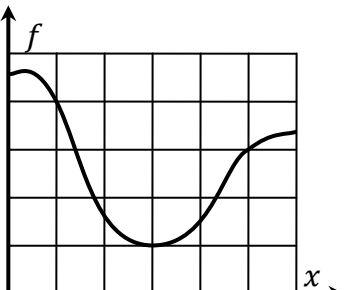
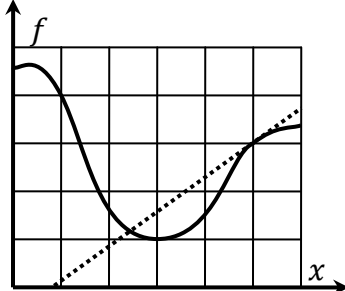
- **words:** the average rate of change of  $f$  as the input changes from  $a$  to  $b$
- **usage:**  $f$  is a function that is continuous on the interval  $[a, b]$ .
- **meaning:** the number  $m = \frac{f(b)-f(a)}{b-a}$
- **graphical interpretation:** The number  $m$  is the slope of the secant line that touches the graph of  $f$  at the points  $(a, f(a))$  and  $(b, f(b))$ .
- **remark:** The average rate of change  $m$  is a number.

#### **Definition of Instantaneous Rate of Change**

- **words:** the instantaneous rate of change of  $f$  at  $a$
- **alternate words:** the derivative of  $f$  at  $a$
- **symbol:**  $f'(a)$
- **meaning:** the number  $m = \lim_{h \rightarrow 0} \frac{f(a+h)-f(a)}{h}$
- **graphical interpretation:** The number  $m$  is the slope of the line tangent to the graph of  $f$  at the point  $(x, y) = (a, f(a))$ .
- **remark:** The instantaneous rate of change  $f'(a)$  is a number.

Each expression in the left column represents a number  $m$  that can be interpreted as the slope of a line on the graph of  $f$ . In each example, draw the line on the graph of  $f$ , or write the missing expression based on the line shown in the graph, and then give the value of the number  $m$  represented by the expression.

<u>Example</u>	<u>Expression representing <math>m</math></u>	<u>Line whose slope is <math>m</math></u>	<u>Value of <math>m</math></u>
(1)	the average rate of change of $f$ as the input changes from 1 to 5		$m =$
(2)	the derivative of $f$ at $x = 1$		$m =$

Example	Expression representing $m$	Line whose slope is $m$	Value of $m$
(3)	the instantaneous rate of change of $f$ at $x = 4$		$m =$
(4)	$\lim_{h \rightarrow 0} \frac{f(3+h) - f(3)}{h}$		$m =$
(5)	$\frac{f(4) - f(2)}{4 - 2}$		$m =$
(6)	$f'(2)$		$m =$
(7)			$m =$