

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.

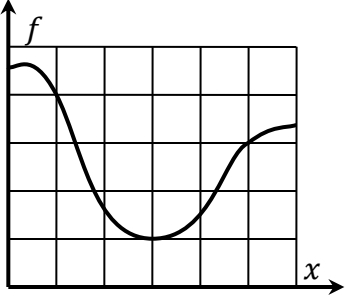
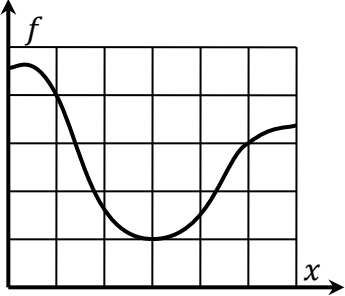
Definition of Average Rate of Change

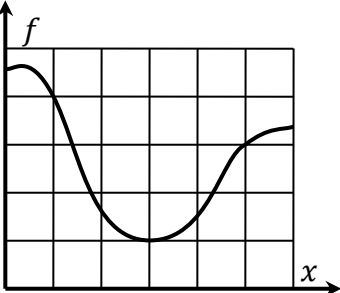
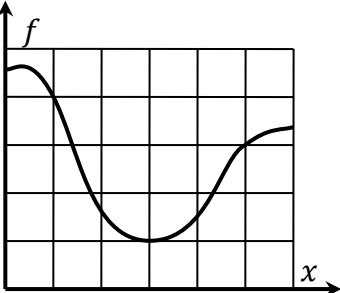
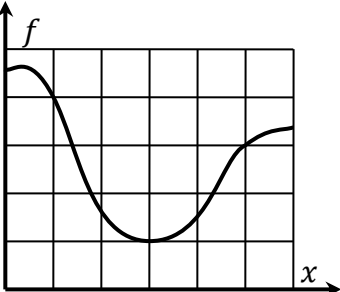
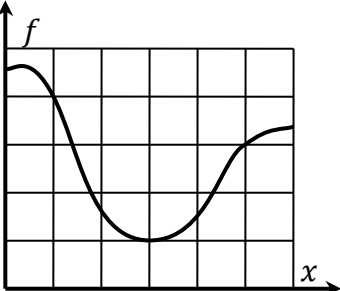
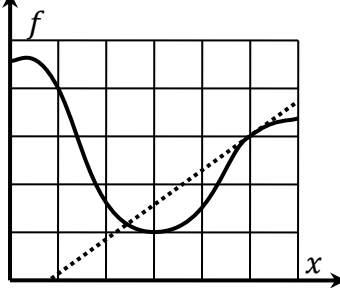
- **words:** the average rate of change of f as the input changes from a to b
- **usage:** f is a function that is continuous on the interval $[a, b]$.
- **meaning:** the number $m = \frac{f(b)-f(a)}{b-a}$
- **graphical interpretation:** The number m is the slope of the secant line that touches the graph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