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.

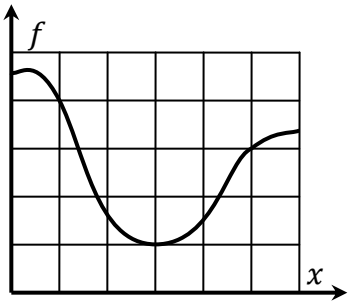
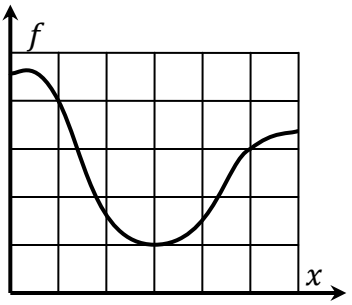
Definition of *Average Rate of Change*

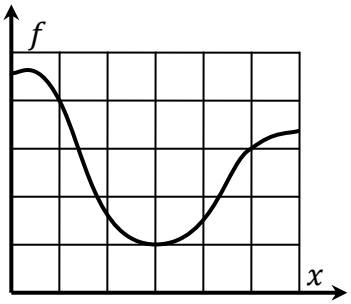
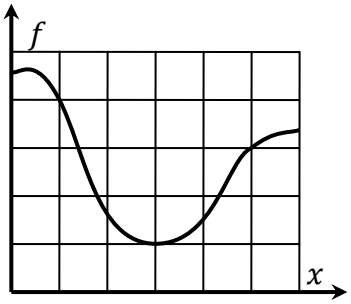
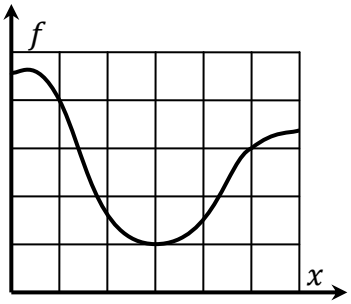
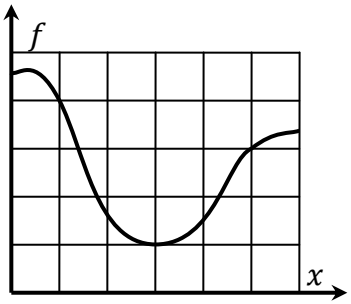
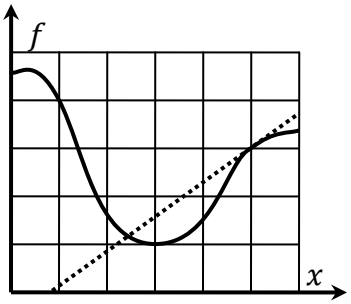
- **words:** the average rate of change of f as the input changes from a to b
- **usage:** f is a function that is continuous on the interval $[a, b]$.
- **meaning:** the number $m = \frac{f(b)-f(a)}{b-a}$
- **graphical interpretation:** The number m is the slope of the secant line that touches the graph of f at the points $\big(a, f(a)\big)$ and $\big(b, f(b)\big)$.
- **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 $m = \lim_{h\to 0} \frac{f(a+h)-f(a)}{h}$
- **graphical interpretation:** The number m is the slope of the line tangent to the graph of f at the point $(x, y) = \big(a, f(a)\big)$.
- **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.

Example	Expression representing m	Line whose slope is m	Value of m
(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)	$\lim_{h \to 0} \frac{f(3+h) - f(3)}{h}$		$m =$
(5)	$\frac{f(4) - f(2)}{4 - 2}$		$m =$
(6)	$f'(2)$		$m =$
(7)			$m =$