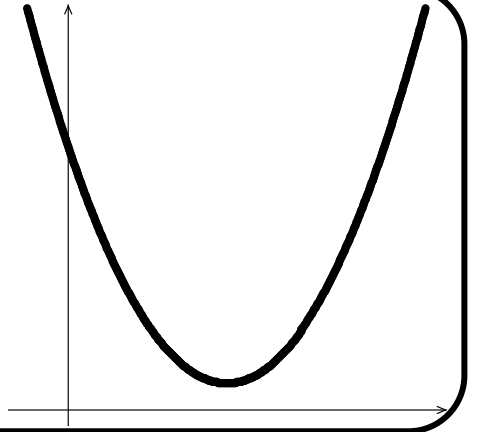


1.3 Rates of Change in Linear and Quadratic Functions

1.3 Notes

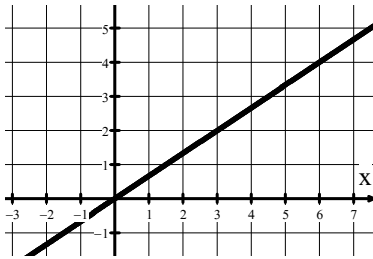
Avg Rate of Change = Slope of a Secant Line

The average rate of change over the closed interval $[a, b]$ is the slope of the secant line from the point $(a, f(a))$ to $(b, f(b))$.

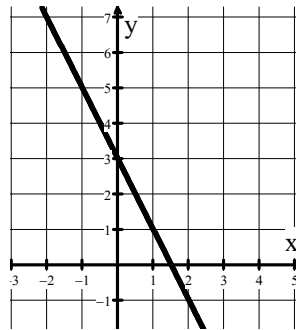


Find the average rate of change for each linear function.

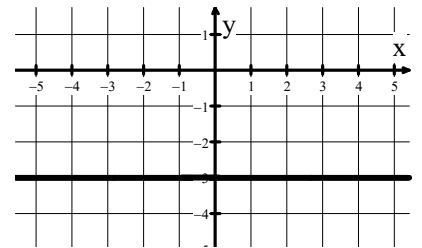
1. $y = \frac{2}{3}x$



2. $y = -2x + 3$



3. $y = -3$



The average rate of change for a linear function is _____. Regardless of the input-value interval length, the average rate of change stays the same!

Find the rate of change of the average rate of change of each linear function.

4. $y = \frac{2}{3}x$

5. $y = -2x + 3$

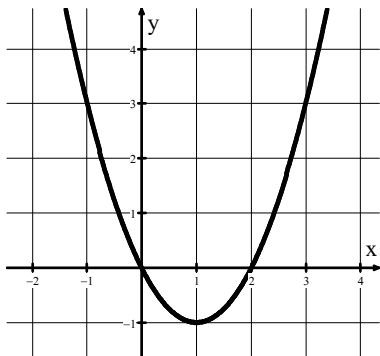
6. $y = -3$

The rate of change of the *average* rates of change of a linear function is _____.

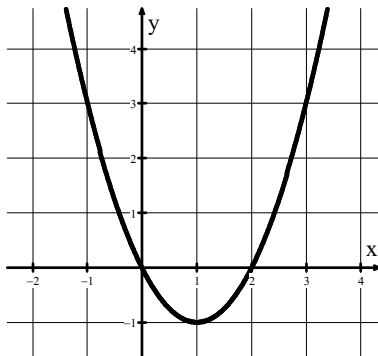
Write your questions
and thoughts here!

Find the average rate of change for the quadratic function $y = x^2 - 2x$ on the given interval.

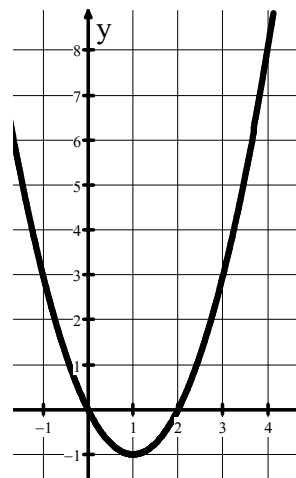
7. $1 \leq x \leq 2$



8. $2 \leq x \leq 3$



9. $3 \leq x \leq 4$



10. $[4, 5]$

11. $[5, 6]$

The average rate of change for a quadratic function does not stay the same. For consecutive equal-length input-value intervals, the rate of change of the average rates of change of a quadratic function is _____. For the above problem, this constant is _____.

12. $f(x) = -2x^2 + 10$.

13. $f(x) = 3x^2 - 2x$.

14. The values of a function g are given at selected x -values in the table below. The function is either concave up or concave down, but not both.

x	15	16	17	18	19
$g(x)$	18	20	20	18	14

Determine if the function is concave up or concave down.

1.3 Rates of Change in Linear and Quadratic Functions

1.3 Practice

AP Precalculus

What is the average rate of change for each function on the given intervals?

1. $y = 7x + 10$ on $-6 \leq x \leq -4$

2. $y = 5x - 3$ on $1 \leq x \leq 7$

3. $y = x^2 + 4x - 2$ on $-3 \leq x \leq 2$

4. $y = 2x^2 + 2x + 1$ on $2 \leq x \leq 5$

For each problem, a quadratic function g has the given average rates of change on an interval.

5. Avg rate of change is 1 on the interval $-3 \leq x \leq 0$.
 Avg rate of change is 5 on the interval $0 \leq x \leq 3$.
 What is the average rate of change of g on the interval $3 \leq x \leq 6$?

6. Avg rate of change is -1 on the interval $1 \leq x \leq 5$.
 Avg rate of change is -7 on the interval $5 \leq x \leq 9$.
 What is the average rate of change of g on the interval $17 \leq x \leq 21$?

7. Avg rate of change is 2 on the interval $-1 \leq x \leq 1$.
 Avg rate of change is 7 on the interval $1 \leq x \leq 3$.
 What is the average rate of change of g on the interval $-3 \leq x \leq -1$?

8. Avg rate of change is -6 on the interval $0 \leq x \leq 5$.
 Avg rate of change is -2 on the interval $5 \leq x \leq 10$.
 What is the average rate of change of g on the interval $20 \leq x \leq 25$?

What is the rate of change of the average rates of change for each function over consecutive equal-length intervals?

9. $y = 13x - 10$

10. $f(x) = x^2 + 3x + 8$

11. $f(x) = 6x - 2x^2 + 1$

The values of a function are given at selected x -values in the table below. The function's concavity does not change. Determine if the function is concave up or concave down. Justify your answer.

12.

x	-8	-6	-4	-2	0
$g(x)$	10	11	14	20	29

13.

x	5	10	15	20	25
$h(x)$	100	75	40	0	-50

1.3 Rates of Change in Linear and Quadratic Functions

1.3 Test Prep

14. The table gives values of the function h for selected values of x .

x	-8	-4	4
$h(x)$	23	17	5

If the function h is linear, what is the value of $h(15)$?

- (A) $-\frac{21}{2}$
- (B) $-\frac{23}{2}$
- (C) -5
- (D) -11

-
15. The table gives values of the function g for selected values of x .

x	0	2	4
$g(x)$	-5	-1	0

If the function g is quadratic, what is the value of $g(8)$?

- (A) -5
- (B) 5
- (C) -7
- (D) 7

-
16. The function p is given by $p(x) = g(x + 1) - g(x)$. If $p(x) = 2$, which of the following statements must be true?

- I. Because p is positive and constant, the graph of g always has positive slope.
- II. Because p is positive and constant, the graph g is concave up.
- III. Because p is positive and constant, g is increasing

- (A) I only
- (B) II only
- (C) III only
- (D) I and III only