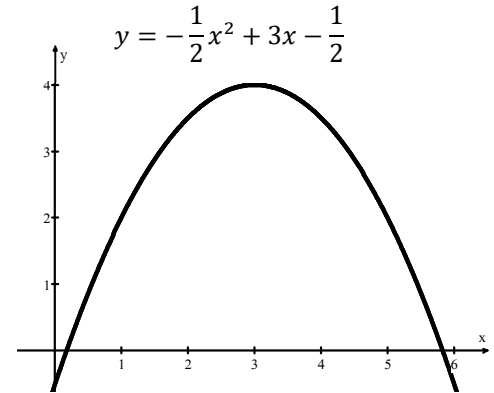


Write your questions
and thoughts here!Average Rate of Change

$$\frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{f(x_2) - f(x_1)}{x_2 - x_1} =$$

1. Find the average rate of change between (1, 2) and (3, 4).



Instead of a graph, let's say we have a table of values, and you want to calculate the average rate of change on an interval. Be careful that the **output values are always in the numerator**.

2. What is the average rate of change on the interval from 13 to 25 seconds?

t time (seconds)	10	13	19	25
$d(t)$ distance (meters)	80	76	43	30

The word *per* is a key indicator that you are dealing with a rate of change. Miles *per* gallon. Students *per* classroom. Online gamers *per* server. It also tells you which variable is dependent or independent, as the dependent is always listed first.

Rate of Change at a Point

What about the rate of change of a function at a point? This tells us about the rate at which the output values would change were the input values to change at that point. We can approximate the rate of change at a point by using the average rates of change over small intervals that contain the point.

3. Estimate the rate of change at $x = 1$ for the function $f(x) = -\frac{1}{2}x^2 + 3x - \frac{1}{2}$.

Write your questions
and thoughts here!

4. Try it on your own! Find an approximation for the rate of change of g at $x = -2$ if $g(x) = e^x$.

Positive and Negative Rates of Change

A **positive** rate of change indicates that as one quantity increases or decreases, the other quantity _____.

A **negative** rate of change indicates that as one quantity increases, the other _____.

State whether the situation represents a positive or negative rate of change.

- | | |
|---|--|
| 5. As the years increase, a high school student body increases. | 6. As Mr. Bean's weight decreases, his running distances increase. |
|---|--|

1.2 Rates of Change

AP Precalculus

1.2 Practice

Find the average rate of change of the function on the given interval.

- | | | |
|--|---|--|
| 1. $h(t) = 3t - t^2$ over the interval $2 \leq t \leq 5$. | 2. $b(w) = w + 2^w$ over the interval $[-1, 2]$. | 3. $f(x) = \ln 3x$ over the interval $1 \leq x \leq 4$. |
|--|---|--|

Use the information in each table to find the average rate of change on the given interval.

4.

t Minutes	3	10	21	43	55
$d(t)$ meters	5	102	135	140	143

a. $3 \leq t \leq 55$

b. $10 \leq t \leq 43$

c. $21 \leq t \leq 55$

5.

t months	6	12	24	48	72
$d(t)$ hair follicles	20,000	19,800	15,000	10,000	7,500

a. $6 \leq t \leq 48$

b. $12 \leq t \leq 72$

c. $6 \leq t \leq 72$

Estimate the rate of change of each function at the given point.

6. $f(x) = \frac{1}{3x}$ at $x = 4$

7. $f(x) = 2x^2 + 1$ at $x = -2$

8. $f(x) = 7\sqrt{x}$ at $x = 2$

9. $f(x) = \ln(2x)$ at $x = 3$

State whether the situation represents a positive or negative rate of change.

10. A candy company uses pints of chocolate to make candy. The more chocolate they use, the more boxes of candy are produced.

11. The amount of money in Josh's savings account decreases for each semester he attends college.

12. As the number of cats Mr. Sullivan owns increases, the number of mice in his barn decreases.

13. As the amount of water Mr. Brust drinks decreases, the fewer trips to the restroom he needs to make.

1.2 Rates of Change

1.2 Test Prep

14. A continuous function f is defined on the closed interval $-5 < x < 6$ and is shown in the graph below. For how many values of b , $-5 < b < 6$, is the average rate of change of f on the interval $[b, 5]$ equal to 0? Give a reason for your answer.

