LESSON MAKER PRO

Rates in Motion

Find how quickly a function changes over an interval.

HIGH SCHOOL · A2S.AF.H.19

A2S.AF.H.19 "Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. Extend to polynomial, trigonometric (sine and cosine)..."

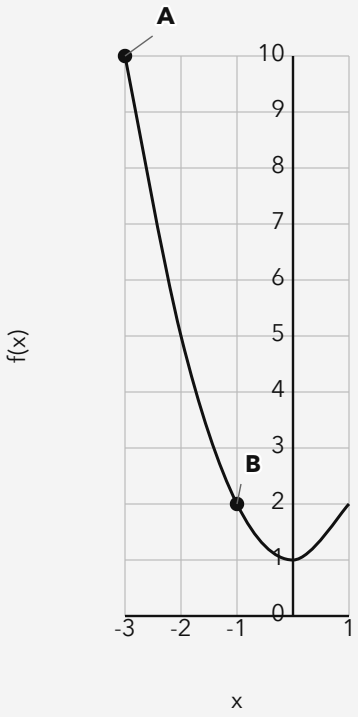
NAME _____ DATE _____

AVERAGE RATE OF CHANGE

To find the average rate of change from x=a to x=b, divide the change in output by the change in input: (f(b)-f(a))/(b-a). On a graph, read the two output values at the ends of the interval, then use the same rule.

WORKED EXAMPLE

Use the graph to find the average rate of change from A to B.

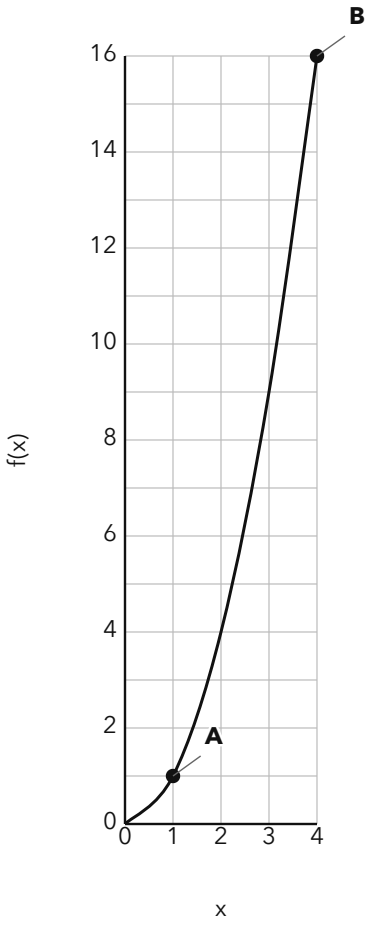


1. Read the points: A is (-3, 10) and B is (-1, 2).
2. Find the changes: 2-10=-8 and -1-(-3)=2.
3. Divide: -8/2=-4.

Answer: -4

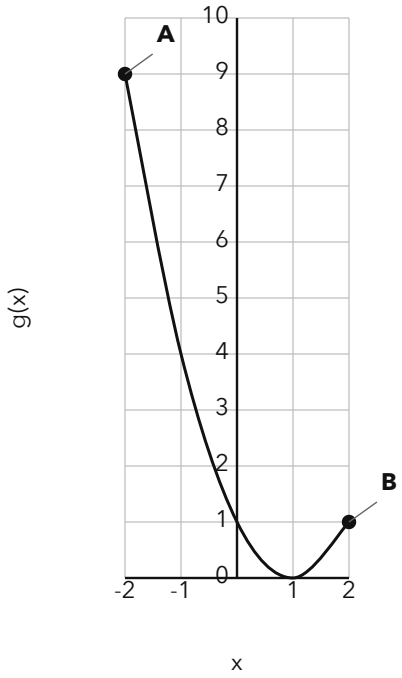
PRACTICE 6 problems

1 Estimate the average rate of change from A to B on the graph.



ANSWER _____

2 Estimate the average rate of change from A to B on the graph.



ANSWER _____

3 Find the average rate of change of $f(x)=x^3-2x$ from x=1 to x=3.

ANSWER _____

4 Find the average rate of change of g(x)=2sin(x) from x=0 to x=pi/2. Use sin(0)=0 and sin(pi/2)=1.

ANSWER _____

5 Find the average rate of change of $h(x)=\log_2(x)$ from x=2 to x=8.

ANSWER _____

6 Find the average rate of change of r(x)=6/x from x=2 to x=6.

ANSWER _____

APPLY IT Show your work

1 A creator tracks views on a new video. Use the table to find the average rate of change in views from hour 2 to hour 6. What does your answer mean?

VIDEO VIEWS

Hours since posting	Views
0	120
2	220
4	400
6	480

ANSWER _____

2 A phone's battery level B(t), in percent, changes with t hours since it was unplugged. For 0<=t<=3, B(t)=80-10t. For 3<t<=7, B(t)=65-5t. Find the average rate of change from t=2 to t=6. Explain what the negative rate means.

WORK SPACE

ANSWER _____

CHALLENGE One step up

For f(x)=sqrt(x+1), find the average rate of change from x=0 to x=3 and from x=3 to x=8. Which interval has the greater rate? Explain using your calculations.

WORK SPACE AND ANSWER

Rates in Motion

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Estimate the average rate of change from A to B on the graph.	**5**
2	Estimate the average rate of change from A to B on the graph.	**-2**
3	Find the average rate of change of $f(x)=x^3-2x$ from x=1 to x=3.	**11**
4	Find the average rate of change of g(x)=2sin(x) from x=0 to x=pi/2. Use sin(0)=0 and sin(pi/2)=1.	**4/pi**
5	Find the average rate of change of $h(x)=\log_2(x)$ from x=2 to x=8.	**1/3**
6	Find the average rate of change of r(x)=6/x from x=2 to x=6.	**-1/2**

PART 2 · APPLY IT

1. **65 views per hour. The video gained an average of 65 views per hour from hour 2 to hour 6.** The table gives 220 views at hour 2 and 480 views at hour 6. Divide the increase of 260 views by 4 hours.
2. **-25/4 percentage points per hour. On average, the battery level fell by 25/4 percentage points per hour from hour 2 to hour 6.** Use the first rule to find B(2)=60 and the second rule to find B(6)=35. Then (35-60)/(6-2)=-25/4.

CHALLENGE

From 0 to 3, the rate is (2-1)/3=1/3. From 3 to 8, it is (3-2)/5=1/5. The interval from 0 to 3 has the greater rate because 1/3>1/5.

Accept equivalent exact fractions and decimal forms where applicable. For graph items, accept the stated rates when students correctly read the plotted endpoints.