LESSON MAKER PRO

Changing Speeds

Practice, Apply, Challenge

HIGH SCHOOL · PC.F.A.25

PC.F.A.25 "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 from polynomial, exponential, logarithmic..."

NAME _____ DATE _____

AVERAGE RATE OF CHANGE

Divide the change in output by the change in input: (f(b) - f(a))/(b - a). To estimate the rate at one point, use points on a graph close to either side of it.

WORKED EXAMPLE

Find the average rate of change between the two rows.

FUNCTION VALUES

x	f(x)
6	14
9	29

1. Output change: 29 - 14 = 15.
2. Input change: 9 - 6 = 3.
3. Average rate: 15/3 = 5.

Answer: 5

PRACTICE 4 problems

1 For f(x) = x^2 - 3x, find the average rate of change on [1, 4].

ANSWER _____

2 For f(x) = 8/x, find the average rate of change on [2, 4].

ANSWER _____

3 For f(x) = sqrt(x + 1), find the average rate of change on [0, 3].

ANSWER _____

4 For f(x) = sin(x), with x in radians, find the average rate of change on [0, pi/2].

ANSWER _____

APPLY IT Show your work

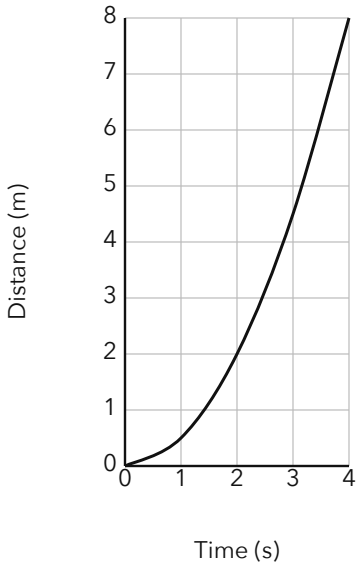
1 Find the average download rates from 0 to 2 min and 2 to 4 min. Which interval is faster?

GAME DOWNLOAD

Time (min)	Downloaded (MB)
0	0
2	10
4	16

ANSWER _____

2 The graph shows a scooter's distance. Estimate its speed at 2 s using the points 1 s before and after.



ANSWER _____

CHALLENGE One step up

For f(x) = 1/(x + 1), simplify (f(x + Δx) - f(x))/Δx. Then find its value at x = 1 and Δx = 1.

WORK SPACE AND ANSWER

Changing Speeds

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For f(x) = x^2 - 3x, find the average rate of change on [1, 4].	**2**
2	For f(x) = 8/x, find the average rate of change on [2, 4].	**-1**
3	For f(x) = sqrt(x + 1), find the average rate of change on [0, 3].	**1/3**
4	For f(x) = sin(x), with x in radians, find the average rate of change on [0, pi/2].	**2/pi**

PART 2 · APPLY IT

1. **5 MB/min and 3 MB/min; 0 to 2 min is faster.** (10 - 0)/(2 - 0) = 5 and (16 - 10)/(4 - 2) = 3. Compare the two rates.
2. **About 2 m/s** Use the points at 1 s and 3 s: (4.5 - 0.5)/(3 - 1) = 2 m/s.

CHALLENGE

-1/((x + 1)(x + Δx + 1)); at x = 1 and Δx = 1, the value is -1/6.

Accept equivalent exact forms. For the graph estimate, accept 2 m/s with a secant calculation using the points at 1 s and 3 s.