KEY AP Precalculus – Mixed Six – Topics 1.1 – 1.3 Rates of Change No Calculator

1. Factual Recall

For the function f on a closed interval $[a,b]$, the average rate of change is $\frac{f(b)-f(a)}{b-a}$ or

The ratio of the change in the output values to the change in the input values over that interval.

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 $(b, f(b))$.

EK: 1.2.A.1 & 1.3.A.3

2. Carry out a Procedure

x	–2	–1	0	1	2
$g(x)$	0	2	3	0	–4

The table above gives values of a function g at selected values of x.

a) What are the zeros of the function g as indicated by the given output values.

$x=-2;\ x=1$

b) The average rate of change of g over equal-length input-value intervals is decreasing for all small-length intervals. What can we say about the concavity of the graph of $g(x)$?

The graph of the function g is concave down.

EK: 1.1.B.5 & 1.3.B.3

3. Classify a Mathematical Object

Classify as Linear (L) or Quadratic (Q)

L/Q: Q

x	$f(x)$
1	–2
2	–1
3	2
4	7

L/Q: L

x	$f(x)$
1	5
2	10
3	15
4	20

L/Q: L

x	$f(x)$
2	8
4	4
6	0
8	–4

L/Q: Q

x	$f(x)$
2	8
4	15
6	19
8	20

EK: 1.3.A.1 & 1.3.A.2

4. Prove, Show, Justify

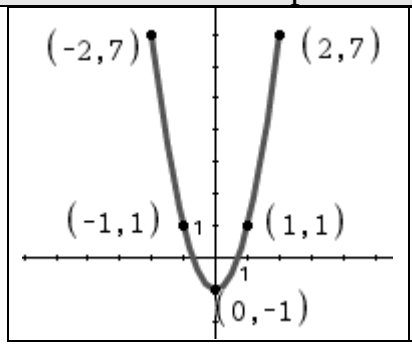
Function h has the following values at selected values of x. Show the average rates of change and the rate of change of the rates, then explain why the function is linear.

x	$h(x)$	rate of change	rate of change of rate
-2	17		
0	13	–2	
2	9	–2	0
4	5	–2	0
6	1	–2	0

Rate of change is constant; average rates of change are changing at a rate of zero

EK: 1.3.A.1 &/or 1.3.B.1

5. Extend a Concept

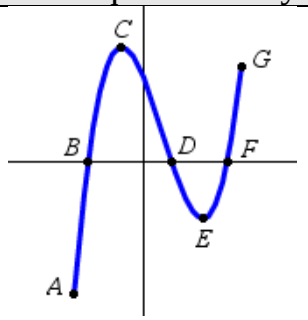


The graph of function k is shown to the left.

Use the given coordinates to calculate the rates of change as the input values increase. What do you notice about the rates of change and what can you say about the concavity of the graph of the function based on the rates of change?

Rates of change over equal length input-value intervals: –6, –2, 2, 6. The rates of change increase so the function is concave up on the interval $(-2,2)$. EK: 1.1.B.3

6. Critique a Fallacy



The graph of a function is shown to the left. The point A has coordinates $(a, f(a))$ and likewise for the other six points.

Sophie states that the function increases over the interval (b,d) because, as the input values increase, the output values are positive. What is wrong with this statement? Write a correct statement about an interval where the function increases. Include a reason for your answer.

KEY - See page 2

EK: 1.1.A.3

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#6: Sophie has the wrong interval and the wrong reason. The function increases over $[a,c]$ or $[e,g]$ because as the input values increase, the output values increase.