LESSON MAKER PRO

Function Change Lab

Find how a function's output changes when its input changes.

HIGH SCHOOL · F.IF.A.2.a

F.IF.A.2.a "Extend evaluating functions to include operations with composite functions, e.g. f(x + 2) – f(x)."

NAME _____ DATE _____

SUBSTITUTE, THEN SUBTRACT

To find f(x + a) - f(x), substitute x + a for the input in the function rule. Then subtract f(x) and simplify. If one function is inside another, evaluate the inside function first.

WORKED EXAMPLE

If f(x) = 11x - 7, find f(8 + 9) - f(8).

1. 8 + 9 = 17, so f(8 + 9) = f(17).
2. f(17) = 11(17) - 7 = 180, and f(8) = 11(8) - 7 = 81.
3. f(8 + 9) - f(8) = 180 - 81 = 99.

Answer: 99

PRACTICE 6 problems

1 If f(x) = 2x + 1, simplify f(x + 3) - f(x).

ANSWER _____

2 If $f(x) = x^2 + 1$, simplify f(x + 2) - f(x).

ANSWER _____

3 If f(x) = 3x - 2 and g(x) = x + 1, find f(g(1)) - f(1).

ANSWER _____

4 If $f(x) = x^2 - 3x$, simplify f(x + 1) - f(x).

ANSWER _____

5 If $f(x) = 2x^2 + 1$ and g(x) = x - 2, simplify f(g(x)) - f(x).

ANSWER _____

6 If $f(x) = x^2 + 2x$ and g(x) = 3x - 1, find f(g(2)) - g(f(2)).

ANSWER _____

APPLY IT Show your work

1 A creator models total video views, in hundreds, x days after posting as $V(x) = x^2 + 20x + 100$. Simplify $V(x + 2) - V(x)$. What does your answer represent?

WORK SPACE

ANSWER _____

2 A gaming café charges $2 to enter and $3 per hour. Its cost function is $C(x) = 2 + 3x$. You decide to play twice as long as planned, represented by $g(x) = 2x$. Find $C(g(1)) - C(1)$. What does it mean?

WORK SPACE

ANSWER _____

CHALLENGE One step up

For $f(x) = 3x^2 - x + 1$, simplify $f(x + 2) - 2f(x + 1) + f(x)$. Explain why the result does not depend on x.

WORK SPACE AND ANSWER

ANSWER KEY # Function Change Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	If f(x) = 2x + 1, simplify f(x + 3) - f(x).	**6**
2	If f(x) = x^2 + 1, simplify f(x + 2) - f(x).	**4x + 4**
3	If f(x) = 3x - 2 and g(x) = x + 1, find f(g(1)) - f(1).	**3**
4	If f(x) = x^2 - 3x, simplify f(x + 1) - f(x).	**2x - 2**
5	If f(x) = 2x^2 + 1 and g(x) = x - 2, simplify f(g(x)) - f(x).	**-8x + 8**
6	If f(x) = x^2 + 2x and g(x) = 3x - 1, find f(g(2)) - g(f(2)).	**12**

PART 2 · APPLY IT

1. **4x + 44 hundreds of views, the predicted increase from day x to day x + 2.** Expand V(x + 2) to get x^2 + 24x + 144. Subtract V(x) to get 4x + 44.
2. **$3, the extra cost of playing 2 hours instead of 1 hour.** g(1) = 2, so C(g(1)) = C(2) = 8 and C(1) = 5. The difference is $3.

CHALLENGE

6. After substitution and simplification, the x^2 terms and the x terms cancel, leaving 6.

Accept equivalent simplified expressions. For the challenge, an explanation that shows the variable terms cancel is sufficient.