LESSON MAKER PRO

Graph Shift Detective

Track how points move when a function changes.

HIGH SCHOOL · F-BF.3

F-BF.3 "Identify the effect on the graph of replacing f(x) by f(x) + k, kf(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs..."

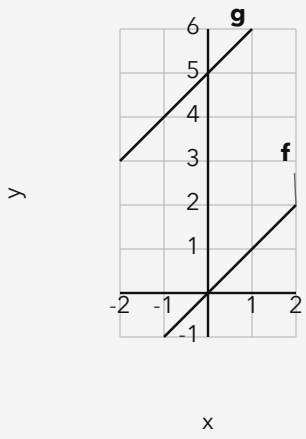
NAME _____ DATE _____

FOLLOW A POINT

For a point (x, y) on f, f(x)+k changes y to y+k, while kf(x) changes y to ky. In f(kx), x changes to x/k; in f(x+k), x changes to x-k.

WORKED EXAMPLE

The graph shows f and g. If g(x)=f(x)+k, find k.



1. At x=0, read f(0)=0 and g(0)=5.
2. Subtract: k=g(0)-f(0)=5-0=5.

Answer: k=5

PRACTICE 4 problems

1 For $f(x)=x^2$ and g(x)=f(x)-1, find the vertex of g.

ANSWER _____

2 The point (2, 4) is on f. If g(x)=-2f(x), where does that point move?

ANSWER _____

3 The point (2, 4) is on f. If g(x)=f(-4x), where does that point move?

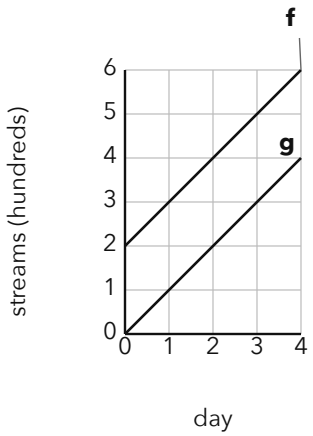
ANSWER _____

4 For $f(x)=x^2$ and g(x)=f(x+2), find the vertex of g.

ANSWER _____

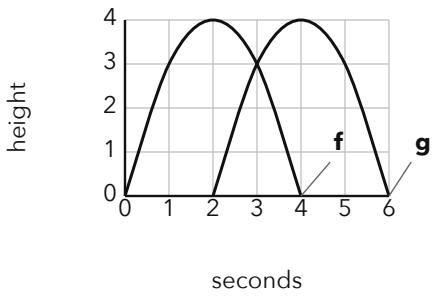
APPLY IT Show your work

1 A music app graphs daily streams in hundreds. If g(x)=f(x)+k, find k and state what changed.



ANSWER _____

2 The graphs show two skaters' jump heights by second. If g(x)=f(x+k), find k. Which skater peaks later, and by how long?



ANSWER _____

CHALLENGE One step up

For $f(x)=x^2$, let $g(x)=-2f(x+1)+4$. Find the vertex of g and where (2, 4) on f moves. Explain both changes.

WORK SPACE AND ANSWER

ANSWER KEY

Graph Shift Detective

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For $f(x)=x^2$ and $g(x)=f(x)-1$, find the vertex of g.	**(0, -1)**
2	The point (2, 4) is on f. If $g(x)=-2f(x)$, where does that point move?	**(2, -8)**
3	The point (2, 4) is on f. If $g(x)=f(-4x)$, where does that point move?	**(-1/2, 4)**
4	For $f(x)=x^2$ and $g(x)=f(x+2)$, find the vertex of g.	**(-2, 0)**

PART 2 · APPLY IT

1. **k=-2; g shows 200 fewer streams each day.** At day 0, g(0)-f(0)=0-2=-2 hundreds of streams.
2. **k=-2; the skater shown by g peaks 2 seconds later.** The peak moves from x=2 to x=4, a shift right by 2. Since f(x+k) shifts left by k, k=-2.

CHALLENGE

The vertex is (-1, 4), and (2, 4) moves to (1, -4). Subtract 1 from each x-coordinate, then multiply each y-coordinate by -2 and add 4.

Accept equivalent descriptions of the shifts. In the challenge, students may apply the vertical changes before the horizontal shift.