LESSON MAKER PRO

Graph Shift Lab

Track what changes and what stays the same.

HIGH SCHOOL · A1P.AF.H.23

A1P.AF.H.23 "Identify the effect on the graph of replacing f(x) by f(x) + k, k · f(x), f(k · x), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs..."

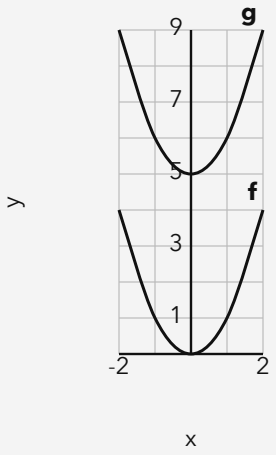
NAME _____ DATE _____

FOLLOW THE POINTS

Adding k to f(x) changes every y-coordinate by k. Multiplying f(x) by k multiplies every y-coordinate by k. In f(k·x), divide each x-coordinate by k; in f(x+k), subtract k from each x-coordinate. A negative multiplier also reflects the graph across an axis.

WORKED EXAMPLE

The grid shows f and g, where g(x)=f(x)+k. Find k.



1. Find the vertex of f: (0, 0).
2. Find the vertex of g: (0, 5).
3. Subtract the y-coordinates: 5-0=5.

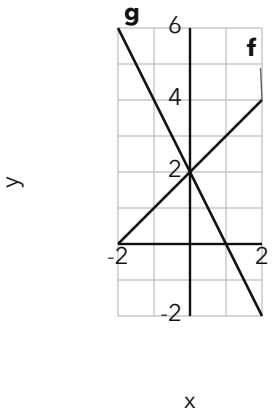
Answer: k=5

PRACTICE 6 problems

1 Let f(x)=|x-1| and g(x)=f(x)-4. What is the vertex of g?

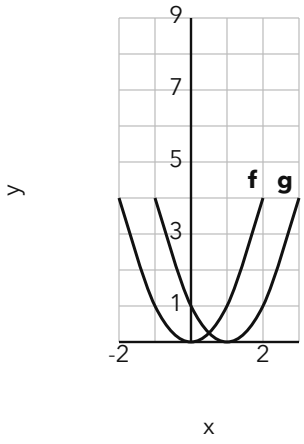
ANSWER _____

2 The grid shows f and g. If g(x)=f(k·x), find k.



ANSWER _____

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



ANSWER _____

4 Let $f(x)=2^x$ and g(x)=-3·f(x). Describe the effect on the graph and find g(0).

ANSWER _____

5 Let f(x)=|x-1| and g(x)=f(x+4). What is the vertex of g?

ANSWER _____

6 Let $f(x)=(x-4)^2$ and g(x)=f(2·x). Give the vertex of g and tell whether its graph is wider or narrower than f.

ANSWER _____

APPLY IT Show your work

1 A music artist models a song's plays with $f(t)=100\cdot 2^t$, where t is days since release. After a playlist features the song, the artist models its plays with $g(t)=4\cdot f(t)$. How many plays does g predict on day 2, and how does its graph compare with f?

WORK SPACE

ANSWER _____

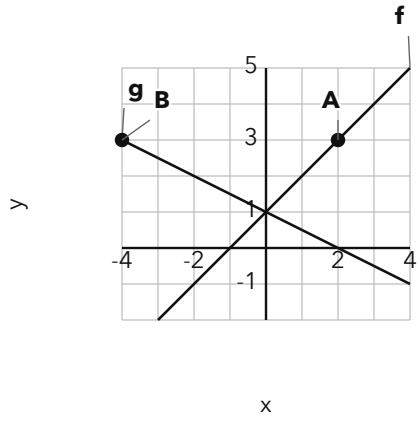
2 A gaming console's resale price is modeled by $f(t)=300-20t$, where t is weeks since release. A tracker uses $g(t)=f(t+2)$ for a console released 2 weeks earlier. What price does the tracker show at t=1, and how does g's graph compare with f?

WORK SPACE

ANSWER _____

CHALLENGE One step up

The grid shows f and g, where $g(x)=f(k\cdot x)$. Find k. Explain how a point on f maps to a point on g.



WORK SPACE AND ANSWER

ANSWER KEY

Graph Shift Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x)=|x-1| and g(x)=f(x)-4. What is the vertex of g?	**(1, -4)**
2	The grid shows f and g. If g(x)=f(k·x), find k.	**k=-2**
3	The grid shows f and g. If g(x)=f(x+k), find k.	**k=-1**
4	Let f(x)=2^x and g(x)=-3·f(x). Describe the effect on the graph and find g(0).	**Reflect f across the x-axis and multiply its y-coordinates by 3; g(0)=-3.**
5	Let f(x)=|x-1| and g(x)=f(x+4). What is the vertex of g?	**(-3, 0)**
6	Let f(x)=$(x-4)^2$ and g(x)=f(2·x). Give the vertex of g and tell whether its graph is wider or narrower than f.	**The vertex is (2, 0); g is narrower than f.**

PART 2 · APPLY IT

1. **1,600 plays; each y-coordinate is 4 times as large.** f(2)=100·4=400, so g(2)=4·400=1,600. The graph is stretched vertically by a factor of 4.
2. **$240; the graph shifts left 2 weeks.** g(1)=f(3)=300-20·3=240. Replacing t with t+2 shifts the graph left 2 units.

CHALLENGE

k=-1/2. Point A at (2, 3) on f maps to point B at (-4, 3) on g. Since 2/k=-4, k=-1/2.

Accept equivalent descriptions of reflections and stretches. For the challenge, an explanation using the slopes, 1 for f and -1/2 for g, also establishes k=-1/2.