LESSON MAKER PRO

Graph Shift Lab

Read changes in a function's graph.

HIGH SCHOOL · A3.G.39

A3.G.39 "Explain the effects of changing the parameters in transformations of functions."

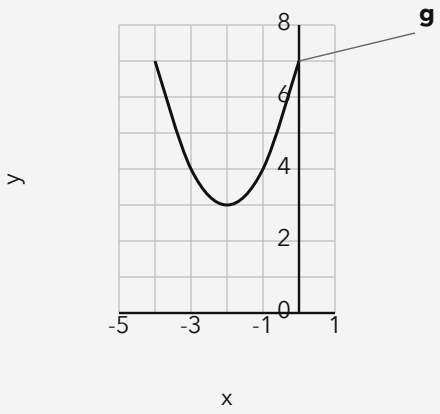
NAME _____ DATE _____

WHAT CHANGES?

In g(x)=a f(x-h)+k, h shifts the graph left or right, and k shifts it up or down. A negative a reflects the graph across the x-axis; |a| greater than 1 stretches it vertically, while |a| between 0 and 1 compresses it.

WORKED EXAMPLE

The graph shows a change to $f(x)=x^2$. Write its equation.



1. The vertex moves from (0, 0) to (-2, 3).
2. That is 2 units left and 3 units up.
3. Replace x with x+2, then add 3.

Answer: $g(x)=(x+2)^2+3$

PRACTICE 4 problems

1 Compare $g(x)=(x-4)^2-2$ with $f(x)=x^2$. Name both shifts.

ANSWER _____

2 Compare $g(x)=-3x^2$ with $f(x)=x^2$. Describe both effects of -3.

ANSWER _____

3 Compare $g(x)=1/2(x+5)^2$ with $f(x)=x^2$. Describe both changes.

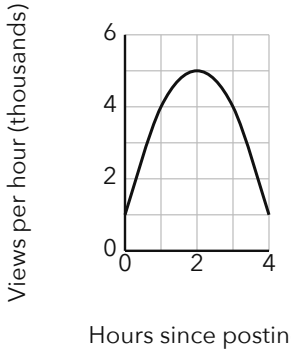
ANSWER _____

4 Compare $g(x)=-|x+6|+4$ with $f(x)=|x|$. Describe all three changes.

ANSWER _____

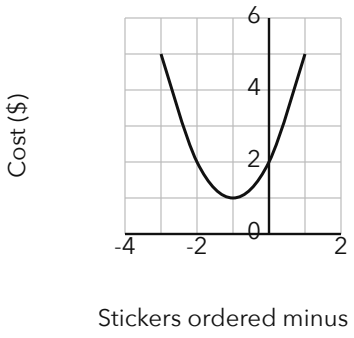
APPLY IT Show your work

1 A video's hourly views follow a shifted $y=-x^2$. Write the graphed model. When do hourly views peak?



ANSWER _____

2 A sticker shop changes $y=x^2$ to model order cost. The x-axis shows stickers ordered minus 4. Write the graphed model and find the cheapest order size.



ANSWER _____

CHALLENGE One step up

Compare $g(x)=-2(x-3)^2+4$ with $f(x)=x^2$. Explain every transformation, then find $g(0)$.

WORK SPACE AND ANSWER

ANSWER KEY

Graph Shift Lab

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Compare $g(x)=(x-4)^2-2$ with $f(x)=x^2$. Name both shifts.	**4 units right and 2 units down**
2	Compare $g(x)=-3x^2$ with $f(x)=x^2$. Describe both effects of -3.	**Reflection across the x-axis and a vertical stretch by a factor of 3**
3	Compare $g(x)=1/2(x+5)^2$ with $f(x)=x^2$. Describe both changes.	**5 units left and a vertical compression by a factor of 1/2**
4	Compare $g(x)=-\|x+6\|+4$ with $f(x)=\|x\|$. Describe all three changes.	**6 units left, 4 units up, and a reflection across the x-axis**

PART 2 · APPLY IT

1. **$y=-(x-2)^2+5$; hourly views peak at 5 thousand, 2 hours after posting.** The vertex is (2, 5), so the parent graph shifts 2 units right and 5 units up.
2. **$y=(x+1)^2+1$; the cheapest order is 3 stickers, costing $1.** The vertex (-1, 1) gives the model and its minimum cost. An x-value of -1 means 4-1, or 3, stickers.

CHALLENGE

Reflect across the x-axis, stretch vertically by a factor of 2, shift 3 units right, and shift 4 units up. $g(0)=-14$.

Accept transformations in any order. For the sticker problem, $x=-1$ is a position on the graph, not the number of stickers.