LESSON MAKER PRO

Graph Shift Detective

Track what changes and what stays the same.

HIGH SCHOOL · FA.F.27

FA.F.27 "Given the graph of function in the form f(x)+ k, kf(x), f(kx), or f(x + k), where k belongs to the set of integers, identify the domain/range, increasing/decreasing intervals, intercepts, symmetry, and asymptotic behavior..."

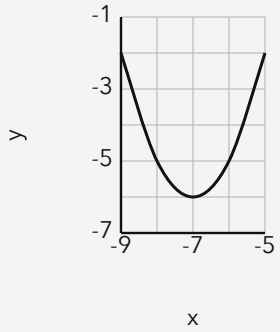
NAME _____ **DATE** _____

READ THE TRANSFORMATION

A vertical shift changes output values, while a horizontal shift changes input values. On a parabola, the turning point helps you find the range and intervals of increase or decrease. A full line or parabola continues beyond the graph window and has no asymptotes.

WORKED EXAMPLE

The graph shows $y = f(x + 7) - 6$, where $f(x) = x^2$. Find its range and increasing interval.



1. Read the lowest point: (-7, -6).
2. The graph has no y-values below -6.
3. To the right of x = -7, the graph rises.

Answer: Range: y >= -6. Increasing: x > -7.

PRACTICE 4 problems

1 Let $f(x) = x^2$ and $g(x) = f(x) + 2$. Find the range and axis of symmetry of g.

ANSWER _____

2 Let $f(x) = x^2$ and $g(x) = f(x + 1)$. Find the x-intercept and decreasing interval of g.

ANSWER _____

3 Let $f(x) = x^2$ and $g(x) = -2f(x)$. Find the domain and range of g.

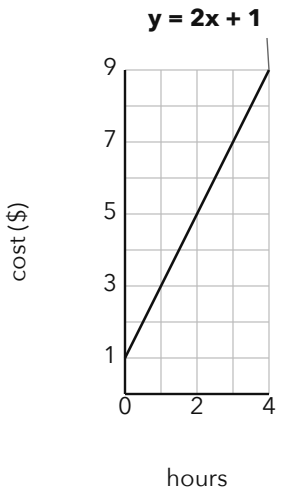
ANSWER _____

4 Let $f(x) = x + 1$ and $g(x) = f(3x)$. Find both intercepts of g.

ANSWER _____

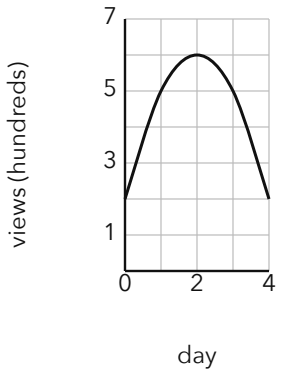
APPLY IT Show your work

1 The graph shows the cost y, in dollars, of spending x hours at a game cafe, for x >= 0. Find the starting cost and the range.



ANSWER _____

2 The graph shows daily views y, in hundreds, during a video launch, from day 0 through day 4. On which day are views highest? When do views increase?



ANSWER _____

CHALLENGE One step up

Let $f(x) = (x - 1)^2$ and $g(x) = f(-2x)$. Find the axis of symmetry and x-intercept of g. Explain why the intercept is negative.

WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Let f(x) = x^2 and g(x) = f(x) + 2. Find the range and axis of symmetry of g.	**Range: y >= 2. Axis of symmetry: x = 0.**
2	Let f(x) = x^2 and g(x) = f(x + 1). Find the x-intercept and decreasing interval of g.	**x-intercept: (-1, 0). Decreasing: x < -1.**
3	Let f(x) = x^2 and g(x) = -2f(x). Find the domain and range of g.	**Domain: all real x. Range: y <= 0.**
4	Let f(x) = x + 1 and g(x) = f(3x). Find both intercepts of g.	**x-intercept: (-1/3, 0). y-intercept: (0, 1).**

PART 2 · APPLY IT

1. **Starting cost: $1. Range: y >= 1.** The y-intercept gives the cost at zero hours. The cost rises from $1 as x increases.
2. **Views are highest on day 2. They increase for 0 <= x < 2.** The vertex is at (2, 6). From day 0 to day 2, the graph rises.

CHALLENGE

Axis of symmetry: x = -1/2. x-intercept: (-1/2, 0). The output is zero when -2x = 1, so x = -1/2.

Accept interval notation or equivalent set notation for domains, ranges, and increasing or decreasing intervals. For the game cafe, apply the stated restriction x >= 0.