LESSON MAKER PRO

Function Shape Shifts

Read a graph, then track what changes.

HIGH SCHOOL · A2.F.1.2

A2.F.1.2 "Identify the parent forms of exponential, radical (square root and cube root only), quadratic, and logarithmic functions. Predict the effects of transformations [f(x + c), f(x) + c, f(cx), and cf(x)] algebraically and graphically."

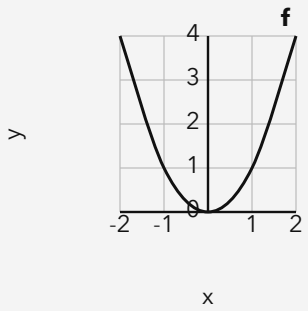
NAME _____ DATE _____

TRACK THE POINTS

A parent function gives a function family its basic shape. For positive c, f(x+c) moves each point left c, and f(cx) divides each x-coordinate by c. The forms f(x)+c and cf(x) change y-coordinates by adding c and multiplying by c, respectively.

WORKED EXAMPLE

The graph shows f. Name its parent form, then find the vertex of g(x)=f(x+6)+7.



1. The graph has the parent form x^2 and vertex (0, 0).
2. The input x+6 moves the vertex left 6 to (-6, 0).
3. Adding 7 moves it up to (-6, 7).

Answer: Parent form: x^2; new vertex: (-6, 7).

PRACTICE 4 problems

1 For f(x)=sqrt(x), name the parent form. Where does (0, 0) move under g(x)=f(x+2)?

ANSWER _____

2 For $f(x)=2^x$, name the parent form. Where does (0, 1) move under g(x)=f(x)+4?

ANSWER _____

3 For f(x)=cbrt(x), name the parent form. Where does (1, 1) move under g(x)=f(4x)?

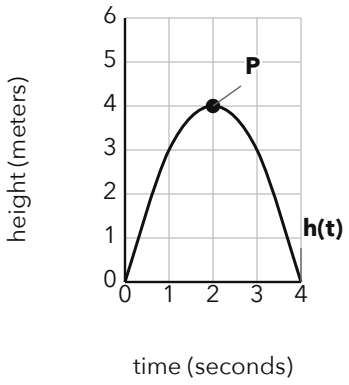
ANSWER _____

4 For $f(x)=\log_{10}(x)$, name the parent form. Where does (10, 1) move under g(x)=2f(x)?

ANSWER _____

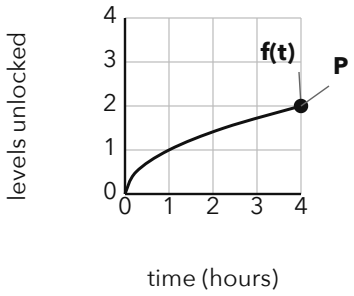
APPLY IT Show your work

1 A game character's jump follows h(t) on the graph. A power-up changes it to h(t)+2. What is the new peak, in seconds and meters?



ANSWER _____

2 The graph shows levels unlocked after t hours in a game. A boost changes progress to g(t)=f(2t). When will the boosted player reach the level marked P?



ANSWER _____

CHALLENGE One step up

For $f(x)=\log_{10}(x)$, a transformation $g(x)=af(bx)$ moves (10, 1) to (5, 3). Find positive a and b. Explain how each changes the point.

WORK SPACE AND ANSWER

ANSWER KEY

Function Shape Shifts

HIGH SCHOOL · A2.F.1.2

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	For f(x)=sqrt(x), name the parent form. Where does (0, 0) move under g(x)=f(x+2)?	**Square root; (-2, 0).**
2	For $f(x)=2^x$, name the parent form. Where does (0, 1) move under g(x)=f(x)+4?	**Exponential; (0, 5).**
3	For f(x)=cbrt(x), name the parent form. Where does (1, 1) move under g(x)=f(4x)?	**Cube root; (1/4, 1).**
4	For $f(x)=\log_{10}(x)$, name the parent form. Where does (10, 1) move under g(x)=2f(x)?	**Logarithmic; (10, 2).**

PART 2 · APPLY IT

1. **2 seconds, 6 meters.** The peak P is (2, 4). Adding 2 to the height moves it to (2, 6).
2. **After 2 hours.** Point P shows that f reaches that level after 4 hours. In f(2t), the time is divided by 2, so the boosted player reaches it after 2 hours.

CHALLENGE

a=3 and b=2. Multiplying the output by 3 changes the y-coordinate from 1 to 3; multiplying the input by 2 divides the x-coordinate from 10 to 5.

Accept equivalent names for the parent forms, such as radical for square root or cube root when the specific root is also identified.