

Algebra 2 · Transformations of Functions · Worksheet

Common Core F-BF.B.3, F-IF.C.7b · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

These 22 problems practice Common Core standards F-BF.B.3 and F-IF.C.7b. Describe and write shifts, stretches, compressions and reflections, test functions for even and odd symmetry, and graph square root and cube root functions.

The early problems are quick checks, the middle ones use graphs and tables, and the last six are word problems about motion, profit, packaging and growth.

Algebra 2 Common Core: F-BF.B.3 · F-IF.C.7b

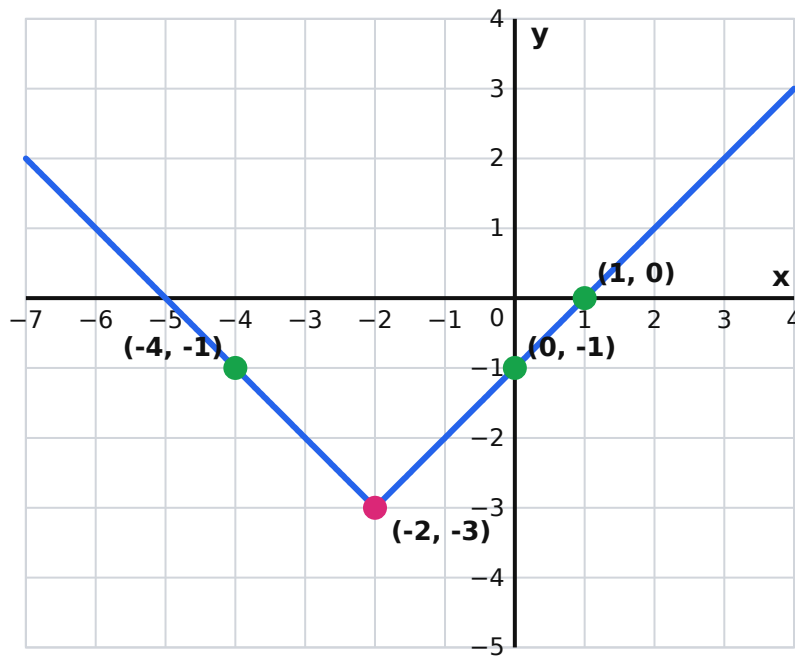
Problem 1: Describe the shift

Describe how each graph is related to the graph of $y = x^2$.

- a. $g(x) = x^2 + 5$
- b. $h(x) = x^2 - 3$
- c. $j(x) = (x - 4)^2$
- d. $k(x) = (x + 1)^2$

Problem 2: Absolute value from a graph

The graph of an absolute value function is shown.



A V-shaped graph.

- Give the vertex.
- Write an equation of the form $y = |x - h| + k$.

Problem 3: Transform a table

The table shows values of $f(x)$. Make a table for each new function.

x	-2	-1	0	1	2
$f(x)$	3	-1	2	5	0

- $f(x) + 4$
- $f(x - 1)$
- $2f(x)$
- $-f(x)$

Problem 4: Reflections

Describe how each graph is related to the graph of $y = \sqrt{x}$, and state the domain of each.

- $g(x) = -\sqrt{x}$
- $h(x) = \sqrt{-x}$

Problem 5: Stretch or compress

Describe how each graph is related to $y = |x|$.

- a. $g(x) = 3|x|$
- b. $h(x) = \frac{1}{3}|x|$
- c. $k(x) = |3x|$

Problem 6: Write the equation

Write an equation for the graph after the transformation.

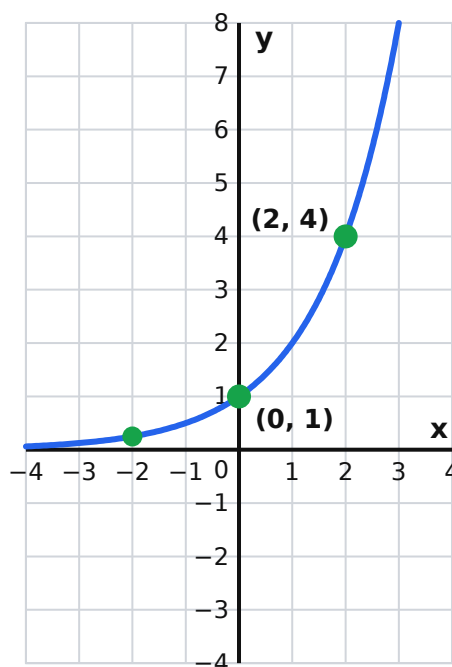
- a. $y = x^2$ shifted left 3 and down 6
- b. $y = |x|$ shifted right 5 and up 1
- c. $y = \sqrt{x}$ shifted down 4
- d. $y = 2^x$ shifted up 3

Problem 7: Several transformations

Describe every transformation of $y = x^2$ that produces $g(x) = -2(x-1)^2 + 5$. State the vertex and whether the parabola opens up or down.

Problem 8: Exponential transformations

The graph of the parent function $f(x) = 2^x$ is shown. Let $g(x) = 2^x - 3$ and $h(x) = 2^{x+1}$.



The parent exponential function.

- a. Give the horizontal asymptote and the y-intercept of g .
- b. Give the horizontal asymptote and the y-intercept of h .
- c. Show that $h(x) = 2 \cdot 2^x$.

Problem 9: Even, odd or neither

Use $f(-x)$ to decide whether each function is even, odd or neither.

- a. $f(x) = x^4 - 3x^2$
- b. $g(x) = x^3 + x$
- c. $h(x) = x^2 + x$

Problem 10: Use symmetry

The function f is odd with $f(1)=3$, $f(2)=-5$ and $f(3)=8$. The function g is even with $g(2)=7$.

- a. Find $f(-1)$, $f(-2)$, $f(-3)$ and $f(0)$.
- b. Find $g(-2)$.

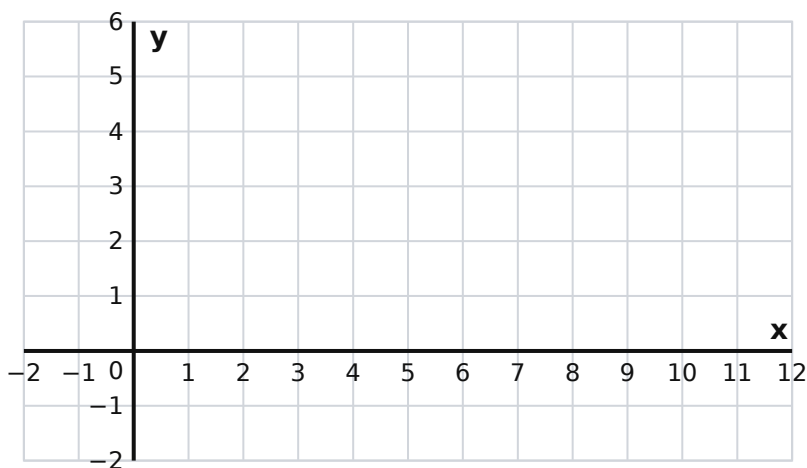
Problem 11: Parent functions and symmetry

Classify each parent function as even, odd or neither, and explain.

- a. $y = |x|$
- b. $y = \sqrt[3]{x}$
- c. $y = \sqrt{x}$
- d. $y = 2^x$

Problem 12: Graph a square root function

Graph $y = \sqrt{x-2} + 1$. Then state the domain and range.



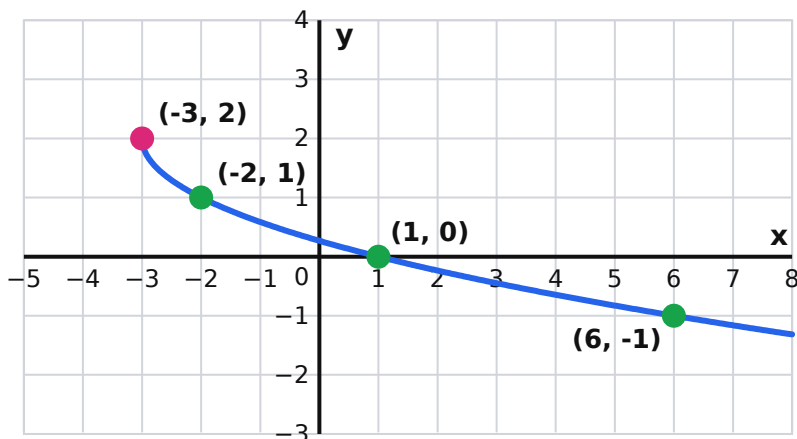
Blank grid.

Problem 13: Graph a cube root function

Graph $y = \sqrt[3]{x+1}-2$ by finding five points, one of them the center. State the domain and range.

Problem 14: Read a square root graph

The graph of a square root function is shown.

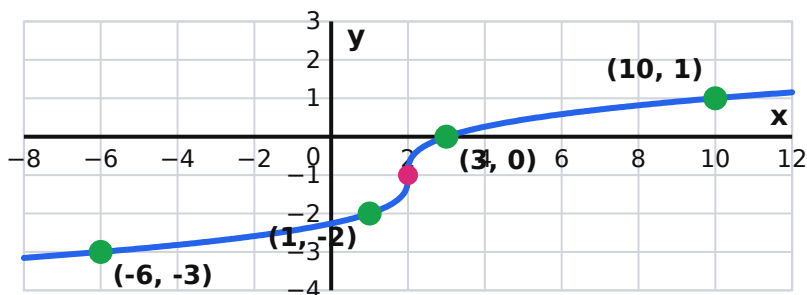


A curve that starts at a point and bends downward.

- State the domain and the range.
- Write the equation in the form $y = a\sqrt{x-h}+k$.

Problem 15: Read a cube root graph

Write an equation of the form $y = \sqrt[3]{x-h}+k$ for the graph.



A cube root curve with its center at the point where it flattens.

Problem 16: Move the points

The point $(6, -4)$ is on the graph of $y = f(x)$. Find the corresponding point on each graph.

- $y = f(x)+3$

- b. $y = f(x-2)$
- c. $y = 2f(x)$
- d. $y = f(3x)$
- e. $y = f(-x)$
- f. $y = -f(x)$

Problem 17: Ball toss

Noah tosses a ball straight up from the ground. Its height in feet after t seconds is $h(t) = -16(t-2)^2 + 64$.

- a. Describe the transformations of $y = t^2$.
- b. Find the maximum height and when it happens.
- c. Find $h(0)$ and $h(4)$, and tell how long the ball is in the air.

Problem 18: Weekly profit

The school store's weekly profit in dollars from selling x hoodies is $P(x) = -2(x-15)^2 + 450$.

- a. Find the maximum profit and the number of hoodies that produces it.
- b. Find $P(10)$ and $P(20)$. Why are they equal?

Problem 19: Gift box

Aisha packs a gift in a cube-shaped box with volume V cubic inches. The edge length of the outer shipping box is $E(V) = \sqrt[3]{V} + 2$ inches, which allows 1 inch of padding on each side.

- a. Describe how the graph of E is related to $y = \sqrt[3]{V}$.
- b. Find $E(27)$ and $E(125)$.
- c. Find the gift volume when the shipping box edge is 9 inches.

Problem 20: Skid marks

Police estimate a car's speed in miles per hour from the length d in feet of its skid marks with $s(d) = \sqrt{24d}$.

- a. Find the speed for skid marks of 6 feet, 54 feet and 150 feet.
- b. Describe s as a transformation of $y = \sqrt{d}$.
- c. How long are the skid marks of a car going 48 mph?

Problem 21: Bacteria colony

Mei's science project grows a colony of $N(t) = 500 \cdot 2^t$ bacteria after t hours.

- Find $N(0)$ and $N(3)$.
- Write $N(t+2)$ and show that it equals $4N(t)$.
- Explain in words why shifting the graph left 2 hours gives the same graph as stretching it vertically by a factor of 4.

Problem 22: Thermostat error

Liam's thermostat is set to 68°F . The error when the room temperature is T degrees is $E(T) = |T - 68|$.

- Describe how the graph of E is related to $y = |T|$.
- Find $E(65)$ and $E(71)$.
- At which temperatures is the error exactly 5 degrees?