

Transformations of Functions and Their Graphs

Grade 11 – Algebra 2 math · Test Answer Key · Standards: F-BF.B.3, F-IF.C.7b

Each solution names the parent function, the transformations, and the key point. Give partial credit for a correct reflection or shift, and require equations in the form the question requests.

Standards: F-BF.B.3, F-IF.C.7b · **Level:** Grade 11 Algebra 2

Question 1 Describe a transformation (2 points)

Reflect across the x -axis, stretch vertically by 2, shift left 4, and shift down 5.

Vertex $(-4, -5)$

Scoring: 1 point for the reflection and stretch, 1 point for the shifts and vertex.

Question 2 Write an equation (2 points)

Stretch: $4\sqrt[3]{x}$. Right 5: replace x by $x - 5$. Up 3: add 3.

$g(x) = 4\sqrt[3]{(x - 5)} + 3$

Scoring: 1 point for the stretch and shift inside, 1 point for the vertical shift.

Question 3 Even or odd (3 points)

a) $f(-x) = x^6 - 2x^2 = f(x)$: **even**.

b) $g(-x) = -x^5 - 4x^3 = -g(x)$: **odd**.

c) $h(-x) = -x^3 + x^2$, which is neither $h(x)$ nor $-h(x)$: **neither**.

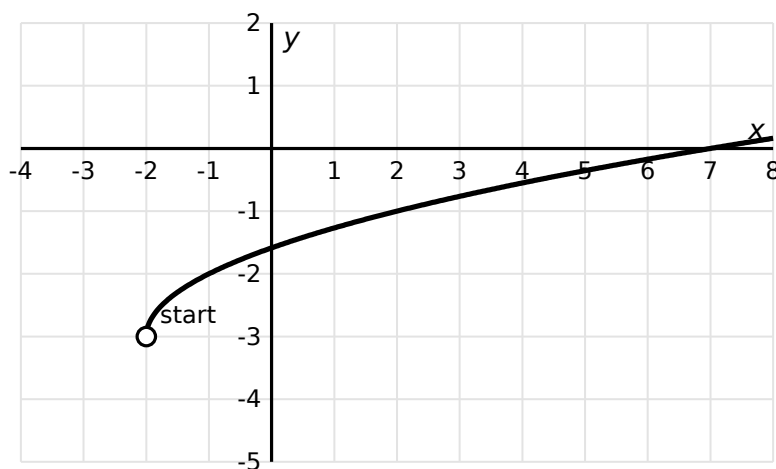
Scoring: 1 point each.

Question 4 Square root graph (3 points)

a) The start $(-2, -3)$ means left 2 and down 3: **$y = \sqrt{(x + 2)} - 3$** . Check $(2, -1)$: $\sqrt{4} - 3 = -1$ ✓.

b) **$x \geq -2$** .

c) $y \geq -3$.



The start point fixes the shifts.

Scoring: 1 point per part.

Question 5 An exponential transformation (3 points)

a) **Left 2 and down 4.**

b) The asymptote $y = 0$ moves down 4: **$y = -4$.**

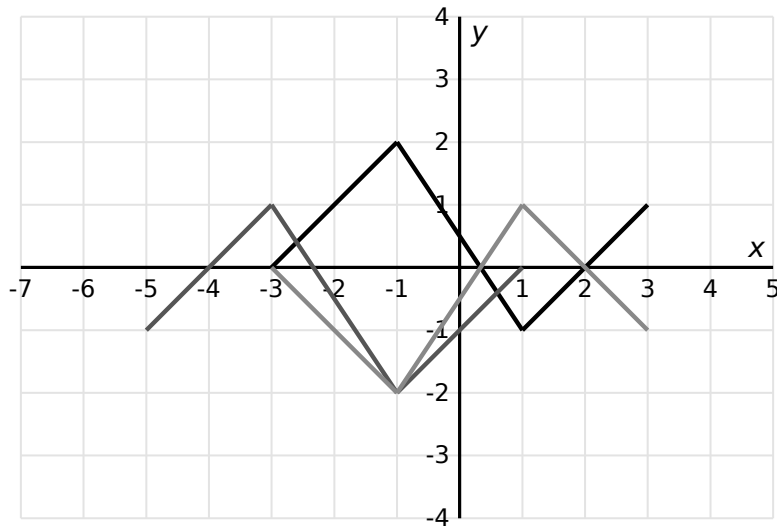
c) $g(0) = 3^2 - 4 = \mathbf{5}$.

Scoring: 1 point per part.

Question 6 Transform a graph (3 points)

a) $f(x + 2)$ shifts left 2 and -1 shifts down 1: **$(-5, -1)$, $(-3, 1)$, $(-1, -2)$, $(1, 0)$.**

b) Change the sign of each y-coordinate: **$(-3, 0)$, $(-1, -2)$, $(1, 1)$, $(3, -1)$.**



f, g, and h.

Scoring: 2 points for g (1 for the horizontal move, 1 for the vertical move); 1 point for h.

Question 7 Profit model (2 points)

Reflect across the n -axis, shift right 40, shift up 900. The vertex is (40, 900).

Greatest profit \$900 when 40 cakes are sold

Scoring: 1 point for the transformation, 1 point for the maximum and the number of cakes.

Question 8 A compression that equals a stretch (2 points)

$$g(x) = (2x)^2 = 4x^2.$$

The point (2, 4) of f becomes (1, 4) on g : the x -coordinate is halved (horizontal compression by $\frac{1}{2}$).

$g(x) = 4x^2$; point (1, 4)

Scoring: 1 point for the expansion, 1 point for the matching point.