

Algebra 1 · Transformations, Absolute Value and Piecewise Functions · Test Answer Key

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

Use this key to score the test out of 20 points. Each solution shows the work and the scoring rule. Give partial credit as described, and check that graphs show correct vertices, intercepts and circle types before awarding the graph point.

Algebra 1 Common Core: F-BF.B.3 · F-IF.C.7b

Question 1: Identify the shifts (2 points)

(a) $g(x) = f(x) - 5$: the graph shifts **down 5 units**; the vertex is $(0, -5)$.

(b) $h(x) = f(x + 6)$: the graph shifts **left 6 units**; the vertex is $(-6, 0)$.

Scoring: 1 point each for the correct direction and distance. Reversing left and right earns 0 for part (b).

Question 2: Equation from a graph (2 points)

The vertex is $(-2, 3)$, so $h = -2$ and $k = 3$. $g(x) = (x + 2)^2 + 3$

Check with $(0, 7)$: $(0 + 2)^2 + 3 = 7$.

Scoring: 1 point for $h = -2$ (written as $x + 2$); 1 point for $k = 3$.

Question 3: Combine transformations (2 points)

Stretch by 3 and flip: $-3|x|$. Shift right 2: $-3|x - 2|$. Shift up 1: $-3|x - 2| + 1$.

$g(x) = -3|x - 2| + 1$, vertex $(2, 1)$.

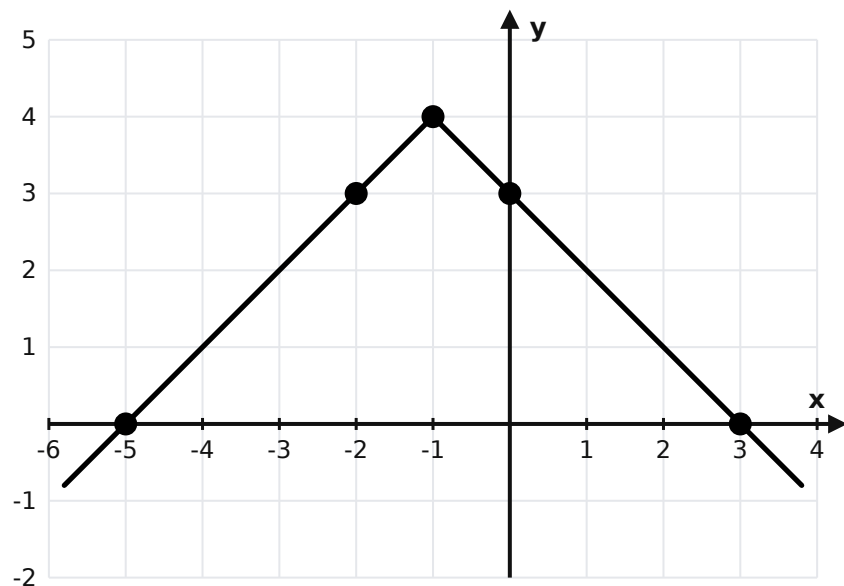
Scoring: 1 point for the factor -3 and the form $a|x - h| + k$; 1 point for $h = 2$ and $k = 1$ (the vertex).

Question 4: Graph an absolute value function (3 points)

(a) $h = -1$, $k = 4$: the vertex is $(-1, 4)$.

(b) $-|x + 1| + 4 = 0$ gives $|x + 1| = 4$, so $x = 3$ or $x = -5$: $(3, 0)$ **and** $(-5, 0)$.

(c) Plot the vertex, the intercepts and $(0, 3)$, $(-2, 3)$, then draw the two rays.



Answer: the graph of $g(x) = -|x+1| + 4$.

Scoring: 1 point each for (a), (b) and (c); in (c) the graph must open down with the correct vertex and intercepts.

Question 5: Evaluate a piecewise function (2 points)

$$f(-2) = 2(-2) + 3 = -1 \text{ (since } -2 < 1).$$

$$f(1) = 8 - 1^2 = 7 \text{ (since } 1 \geq 1).$$

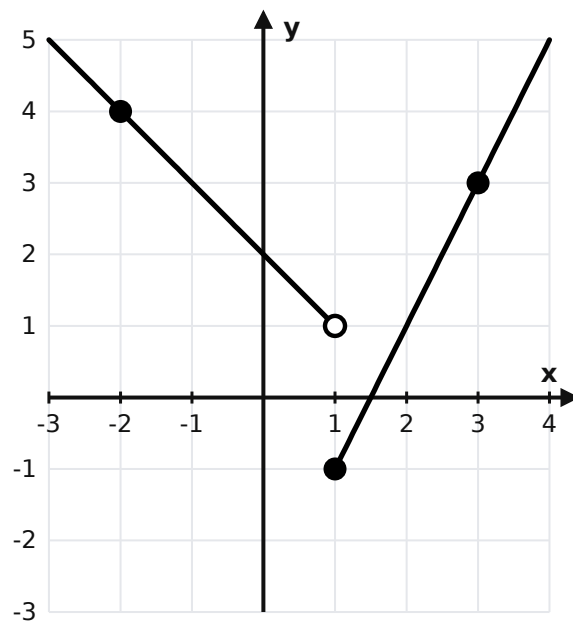
$$f(3) = 8 - 3^2 = 8 - 9 = -1. \quad -1, 7, -1$$

Scoring: 2 points for all three correct; 1 point for exactly two correct.

Question 6: Graph a piecewise function (3 points)

Left piece: $f(-2) = 4$, $f(0) = 2$; at $x = 1$ the rule gives 1, an **open circle at (1,1)**.

Right piece: $f(1) = 2 - 3 = -1$, a **closed circle at (1,-1)**; $f(2) = 1$, $f(3) = 3$.



Answer: open circle at $(1,1)$, closed circle at $(1,-1)$.

Scoring: 1 point for the correct left piece; 1 point for the correct right piece; 1 point for the correct open and closed circles at $x=1$.

Question 7: Read a step function (2 points)

(a) At $x=2$ the closed circle is at height 6. \$6

(b) 2.5 pounds is between 2 and 3, where the height is 8. \$8

Scoring: 1 point for each correct cost. Answering \$7 for part (b) by connecting the steps earns 0.

Question 8: Tolerance of rods (2 points)

(a) $|11.7-12| = |-0.3| = 0.3 > 0.25$. **Not acceptable.**

(b) $-0.25 \leq x-12 \leq 0.25$, so $11.75 \leq x \leq 12.25$.

Scoring: 1 point for (a) with the value 0.3 compared with 0.25; 1 point for (b).

Question 9: Inside or outside (2 points)

$y=(x+3)^2$ shifts $y=x^2$ left 3: vertex $(-3,0)$; at $x=0$, $y=9$, so the y-intercept is $(0,9)$.

$y=x^2+3$ shifts $y=x^2$ up 3: vertex $(0,3)$; at $x=0$, $y=3$, so the y-intercept is $(0,3)$.

The vertices and y-intercepts differ, so **the graphs are different.**

Scoring: 1 point for the two correct vertices; 1 point for the two correct y-intercepts.

Total
20 points