Plot Graph Transformations: Shift, Stretch, and Reflect with Confidence

Complete worked example / separate answer key

Parent function y = f(x) has key points (0,0), (1,1), (4,2), and (9,3). Plot y = -2f(x - 1) + 4 using a point table.

Answer: Apply the rule to each point: new x = x + 1, new y = -2y + 4. The transformed points are (1,4), (2,2), (5,0), and (10,-2). Plot these points on the same grid scale and connect them smoothly. The graph is the parent curve shifted right 1, stretched vertically by 2, reflected across the x-axis, and shifted up 4.

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Original tasks 1, 2, 3 / complete keys

Task 1

Parent y = f(x) has points (0,0), (1,1), (4,2), and (9,3). Plot y = f(x) + 3. List the transformed points.

Answer: (0,3), (1,4), (4,5), (9,6). The graph shifts up 3.

Reason: Adding 3 outside the function adds 3 to every y-coordinate. The x-coordinates stay the same, so each point moves three squares up on a one-unit grid.

Check: Substitute x = 4 into the rule: parent y = 2, so new y = 2 + 3 = 5, matching (4,5). Confirm that the shape is unchanged and every point is exactly 3 units higher.

Task 2

Parent y = f(x) has points (0,0), (1,1), (4,2), and (9,3). Plot y = f(x - 2). List the transformed points.

Answer: (2,0), (3,1), (6,2), (11,3). The graph shifts right 2.

Reason: The inside change x - 2 shifts the graph right by 2, so add 2 to every x-coordinate. The y-coordinates are unchanged.

Check: The parent point (0,0) moves to (2,0). Substitute x = 6: inside is 6 - 2 = 4, and parent y at x = 4 is 2, matching (6,2).

Task 3

Parent y = f(x) has points (0,0), (1,1), (4,2), and (9,3). Plot y = 3f(x). List the transformed points.

Answer: (0,0), (1,3), (4,6), (9,9). The graph stretches vertically by a factor of 3.

Reason: Multiplying outside by 3 multiplies every y-coordinate by 3. The x-coordinates stay the same, so the curve becomes three times taller.

Check: For x = 4, parent y = 2, so new y = 3 times 2 = 6, matching (4,6). Check that the point (0,0) stays fixed because 3 times 0 is 0.

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Original tasks 4 / complete keys

Task 4

Parent y = f(x) has points (0,0), (1,1), (4,2), and (9,3). Plot y = -f(x) + 1. List the transformed points.

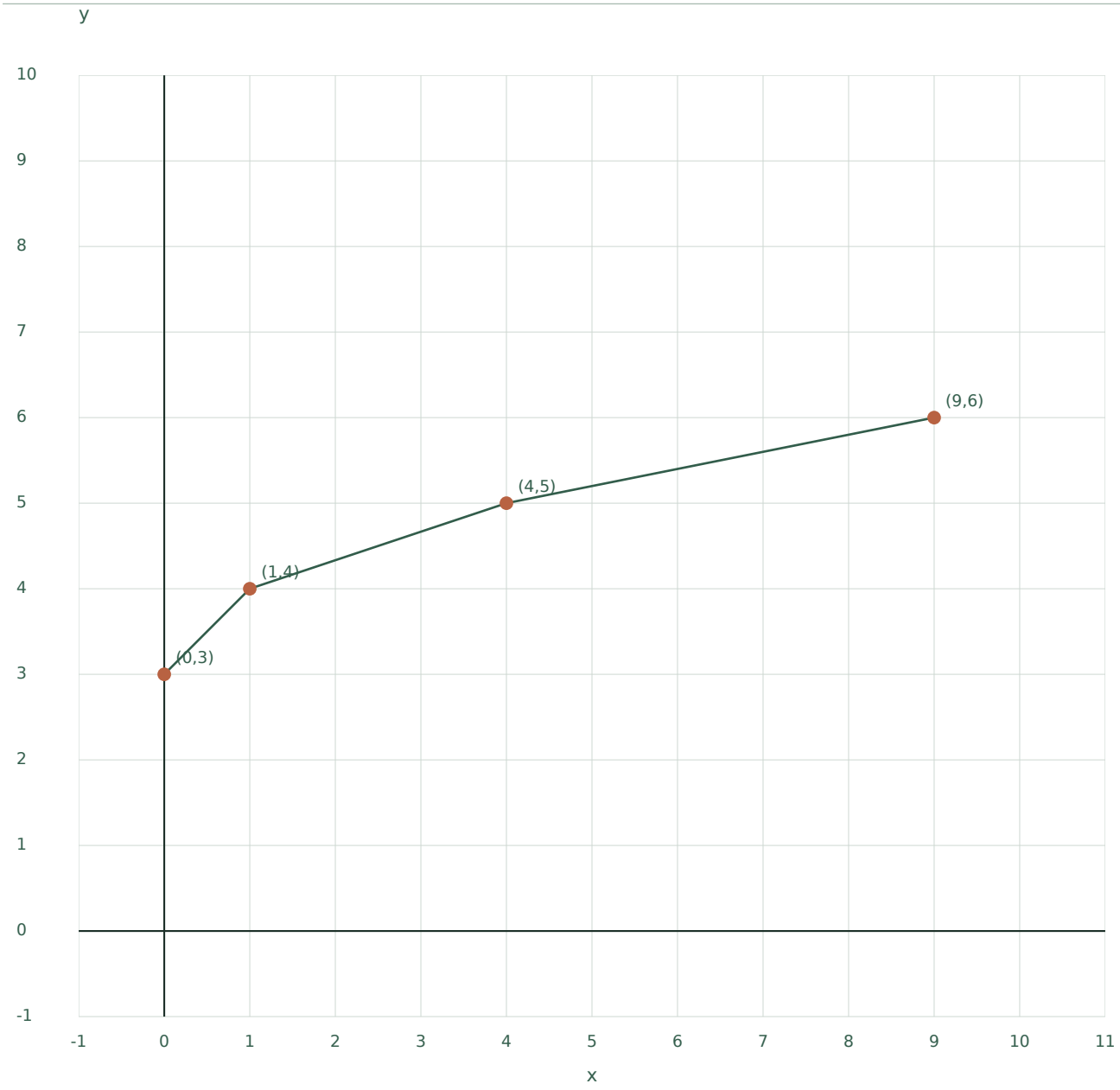
Answer: (0,1), (1,0), (4,-1), (9,-2). The graph reflects across the x-axis and shifts up 1.

Reason: The negative sign outside negates every y-coordinate, reflecting the graph over the x-axis. Then adding 1 shifts every y-coordinate up by 1. The x-coordinates are unchanged.

Check: For x = 4, parent y = 2, so -2 + 1 = -1, matching (4,-1). Confirm that the point (0,0) becomes (0,1), which is one unit above the x-axis.

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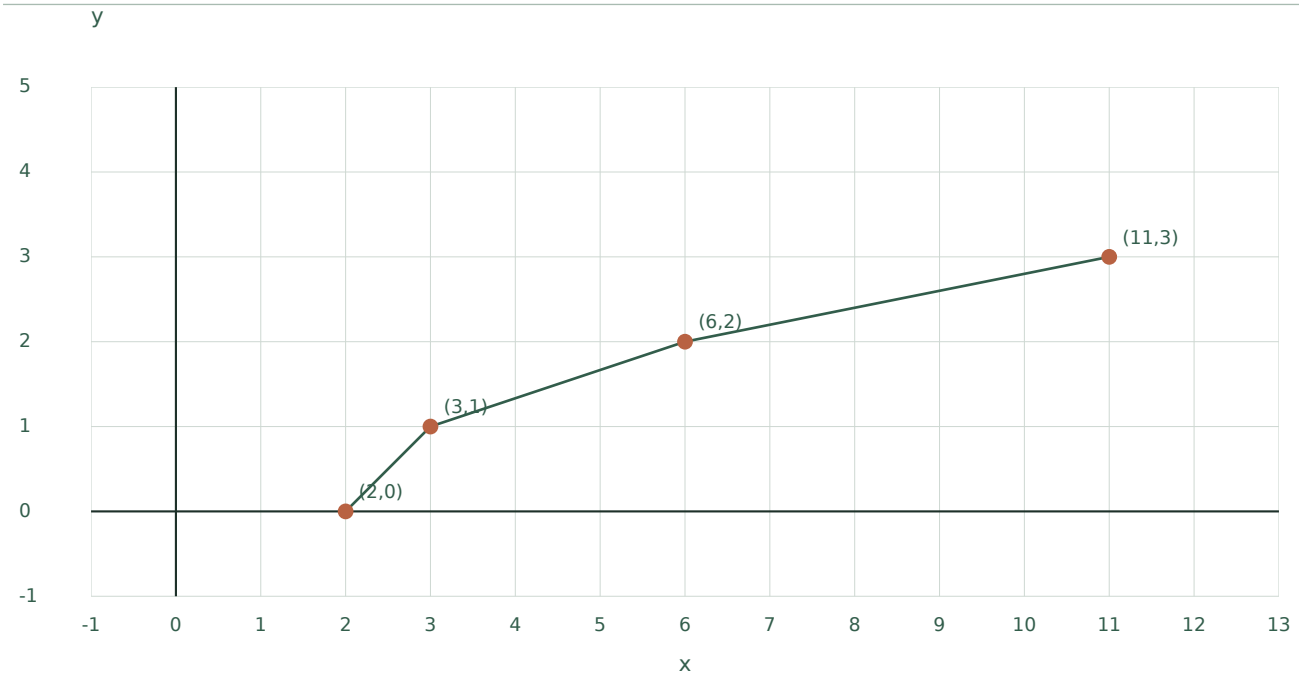
Task 1 / Answer key: y = f(x) + 3



Exercise 1 answer graph.

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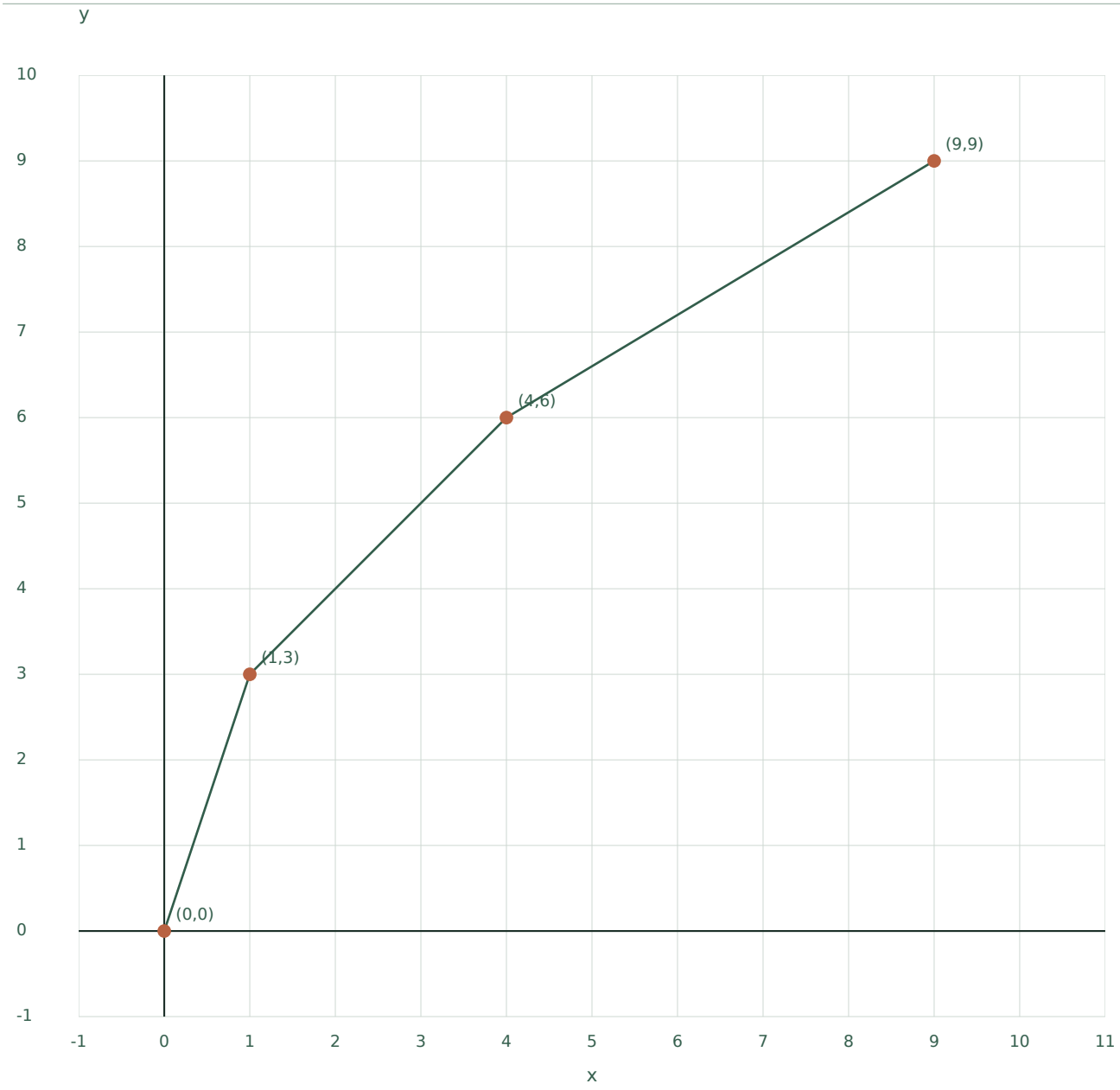
Task 2 / Answer key: y = f(x - 2)



Exercise 2 answer graph.

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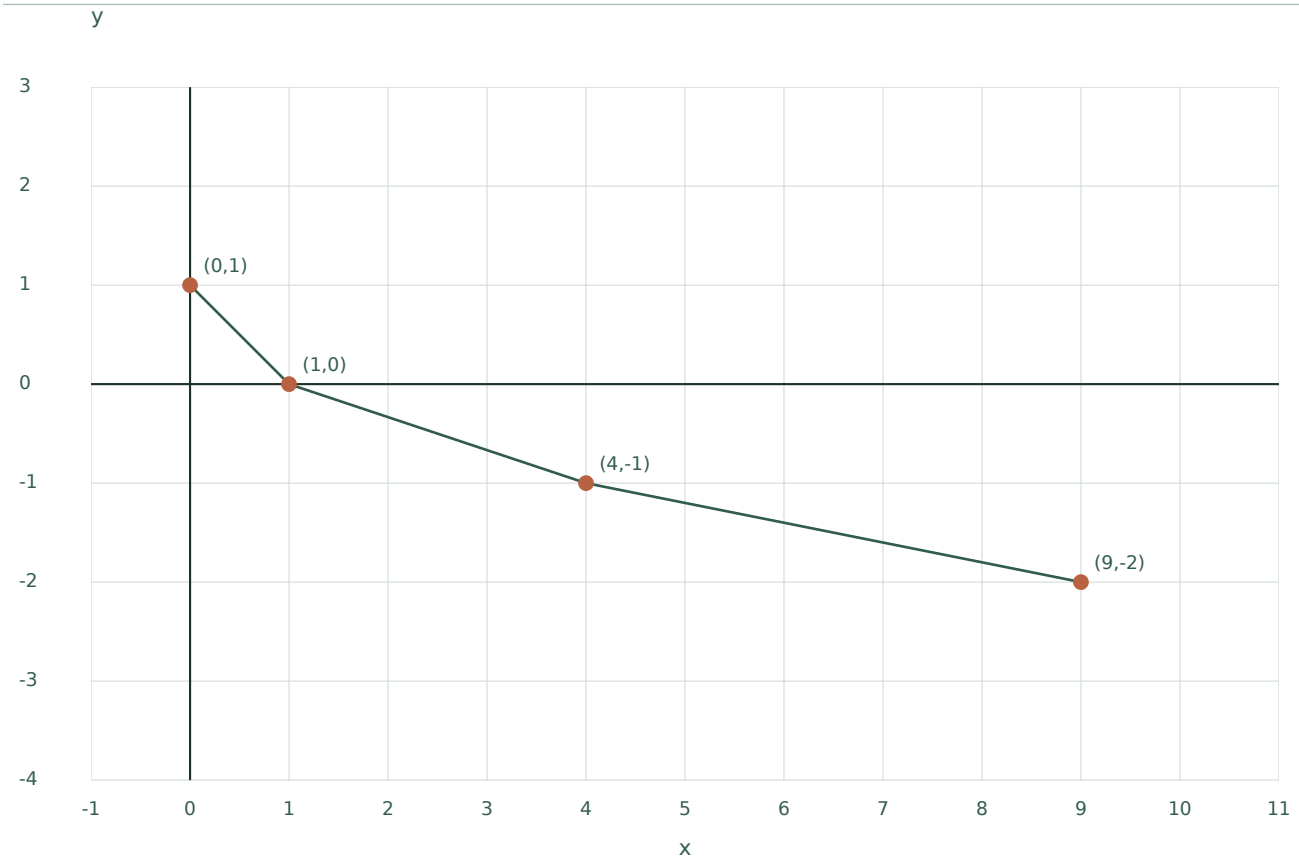
Task 3 / Answer key: y = 3f(x)



Exercise 3 answer graph.

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Task 4 / Answer key: y = -f(x) + 1



Exercise 4 answer graph.

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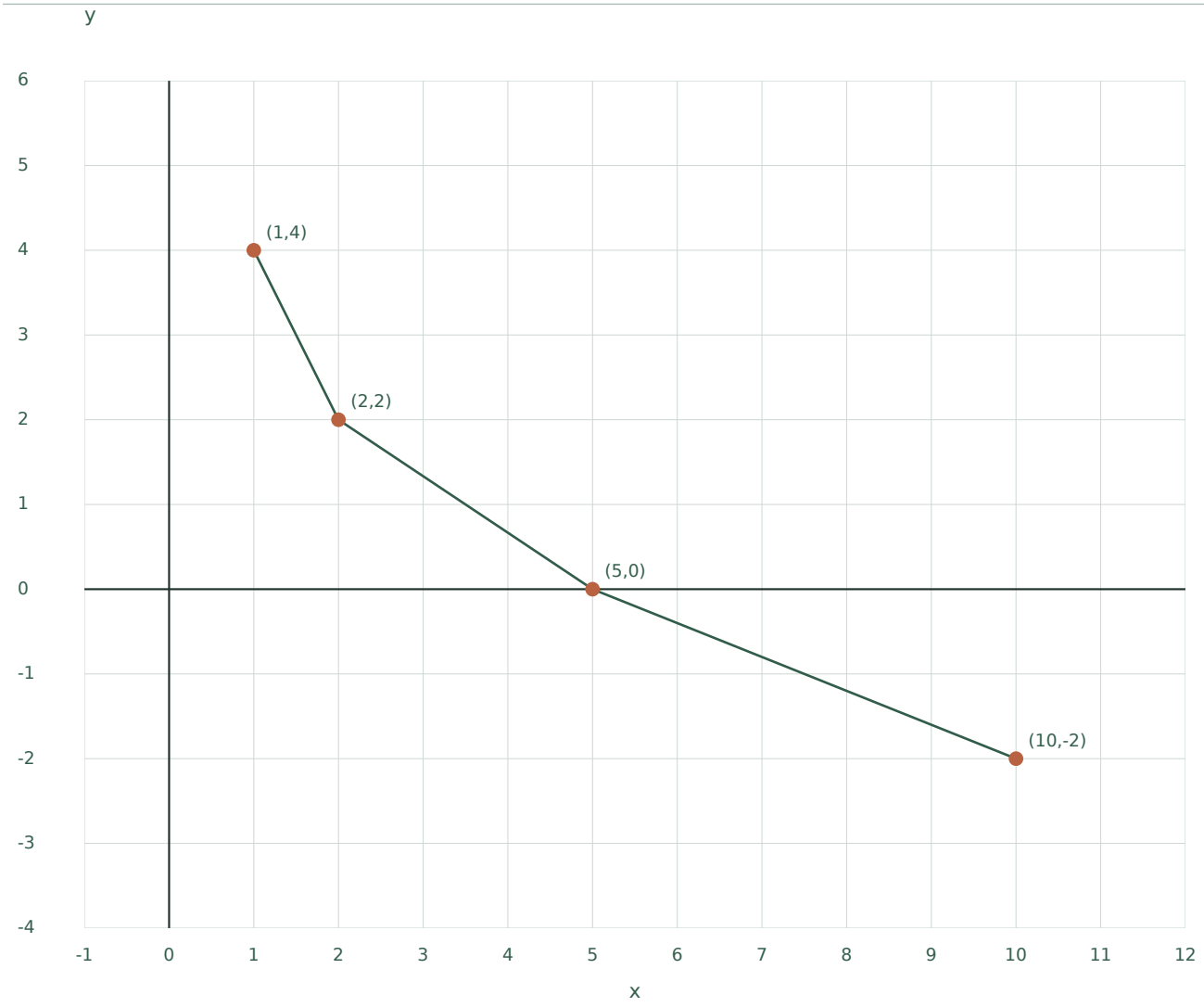
Worked example, Task 1, Task 2, Task 3, Task 4 / Answer key: point lists and descriptions

Transformed point lists and brief descriptions of each change.

Rule	Transformed points	Description of change
y = -2f(x - 1) + 4	(1,4), (2,2), (5,0), (10,-2)	Shift right 1, stretch vertically by 2, reflect across x-axis, shift up 4.
y = f(x) + 3	(0,3), (1,4), (4,5), (9,6)	Shift up 3.
y = f(x - 2)	(2,0), (3,1), (6,2), (11,3)	Shift right 2.
y = 3f(x)	(0,0), (1,3), (4,6), (9,9)	Vertical stretch by factor 3.
y = -f(x) + 1	(0,1), (1,0), (4,-1), (9,-2)	Reflect across x-axis, then shift up 1.
y = f(-x)	(0,0), (-1,1), (-4,2), (-9,3)	Reflect across y-axis.

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Worked example / Answer key: worked example y = -2f(x - 1) + 4



Worked-example transformed graph.

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Source rubric / reflection

- [ ] Correctly identifies the parent function and at least four key points.
- [ ] Applies horizontal changes to x-coordinates with the correct opposite-sign shift.
- [ ] Applies vertical stretch or compression and any reflection to y-coordinates correctly.
- [ ] Plots transformed points accurately on a labeled grid with consistent scale.
- [ ] Connects points smoothly in the same order as the parent graph.
- [ ] Labels the transformed equation and shows a check by substitution or point comparison.
- [ ] Uses a clearly defined convention for any sketch or handwriting, such as labeling axes and marking key points, while allowing valid alternative point choices.

Reflection: What did you check, what did you change, and what will you try next?