Drawing Graphs to Meet Domain and Range Constraints

Original tasks 1, 2 / complete keys

Task 1

Sketch a function with domain [0, 3] and range [1, 5]. Write the domain and range in interval notation.

Answer: A valid graph is a line segment from (0, 1) to (3, 5). Domain: [0, 3]; Range: [1, 5].

Reason: The line segment covers all x from 0 to 3 and produces y-values from 1 to 5. Endpoints are closed, so use closed dots.

Check: Verify that the graph passes through (0,1) and (3,5), and that for x=1.5, y=3, which is within [1,5].

Task 2

Sketch a function with domain (2, 6) and range [0, 4]. Write the domain and range in interval notation.

Answer: One valid graph is a piecewise-linear function made of three connected segments: from (2, 1) down to (3, 0), then up to (5, 4), then down to (6, 1). Use open circles at (2, 1) and (6, 1) because x=2 and x=6 are excluded. The lowest point is (3, 0), so y=0 is attained; the highest point is (5, 4), so y=4 is attained. Domain: (2, 6); Range: [0, 4].

Reason: The domain excludes 2 and 6, so use open circles at x=2 and x=6. The range includes 0 and 4, so the graph must reach y=0 and y=4 at some x in the domain. Since x=2 and x=6 are excluded, attain y=0 at the interior x=3 and y=4 at the interior x=5. The three segments form a single function: each x in (2, 6) has exactly one y-value.

Check: Check that the graph does not include x=2 or x=6 (open circles), that some interior x gives y=0 and some interior x gives y=4, and that all y-values lie in [0, 4].

Drawing Graphs to Meet Domain and Range Constraints

Original tasks 3, 4 / complete keys

Task 3

Sketch a function with domain [-1, 2] and range (-3, 1). Write the domain and range in interval notation.

Answer: One valid discontinuous function is f(x) = (4x-5)/3 for -1 < x < 2, with f(-1) = 0 and f(2) = 0. Draw the sloping segment with open endpoints at (-1, -3) and (2, 1), then separate closed dots at (-1, 0) and (2, 0). Domain: [-1, 2]; Range: (-3, 1).

Reason: The open sloping segment takes every y-value strictly between -3 and 1. Its endpoint limits -3 and 1 are excluded. The two closed dots add the required domain endpoints, while their y-value 0 is already in the range. Every allowed x still has exactly one y-value.

Check: For any target -3 < y < 1, the interior solution x = (3y+5)/4 satisfies -1 < x < 2 and gives f(x) = y. Check that the open limit points are not included, that the two domain-endpoint dots have y = 0, and that the vertical line test holds. Merely drawing a closed segment from (-1, -2.9) to (2, 0.9) would instead give range [-2.9, 0.9], which is too small.

Task 4

Sketch a function with domain [0, 5) and range [2, 6]. Write the domain and range in interval notation.

Answer: One valid graph is a curve that starts at (0, 2) with a closed dot, rises to reach y=6 at an interior x such as x=4, then descends to approach (5, 3) with an open circle, staying within y between 2 and 6. Domain: [0, 5); Range: [2, 6].

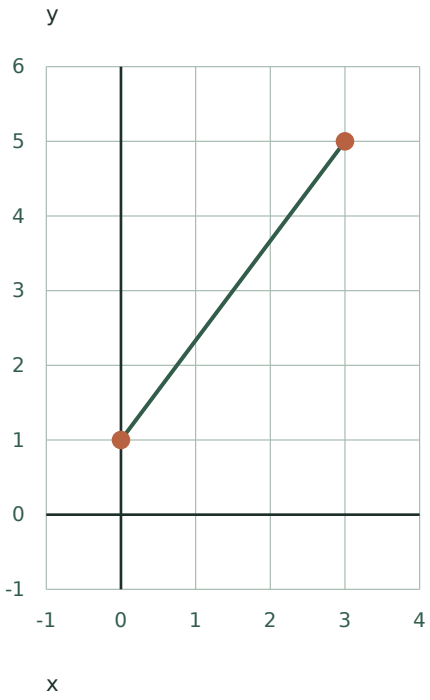
Reason: The domain includes 0 but excludes 5, so use a closed dot at x=0 and an open circle at x=5. The range includes 2 and 6, so the graph must reach y=2 and y=6 at some x in the domain. Since x=5 is excluded, attain y=6 at an interior x such as x=4. The value x=4 is a hypothetical example chosen for easy checking.

Check: Check that the graph includes x=0 and does not include x=5 (open circle), that the minimum y is 2 (attained at x=0) and maximum y is 6 (attained at x=4), and that all y-values lie in [2, 6]. Test an interior value such as x=2 to confirm its y-value is within [2, 6].

Drawing Graphs to Meet Domain and Range Constraints

Task 1 / exact interval key

Sketch a function with domain [0, 3] and range [1, 5]. Write the domain and range in interval notation.



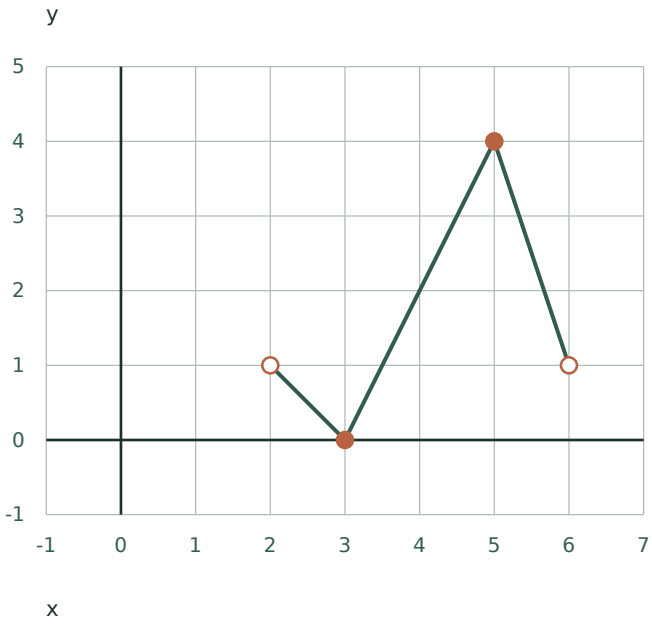
Each horizontal interval = 1; each vertical interval = 1. The axes show a display window, not a newly imposed domain.

Included points: (0, 1), (3, 5).

Drawing Graphs to Meet Domain and Range Constraints

Task 2 / exact interval key

Sketch a function with domain (2, 6) and range [0, 4]. Write the domain and range in interval notation.



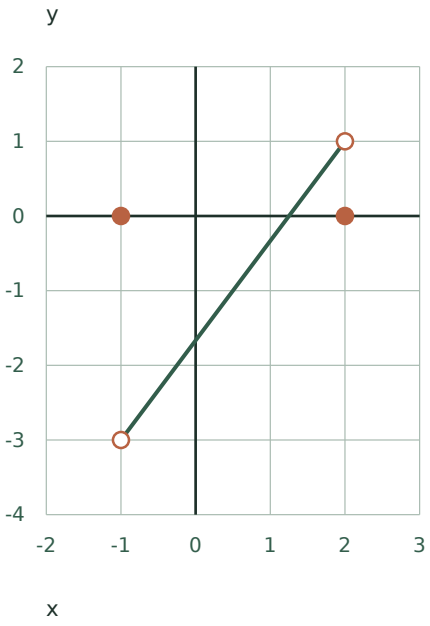
Each horizontal interval = 1; each vertical interval = 1. The axes show a display window, not a newly imposed domain.

Open circles: (2, 1), (6, 1). Included points: (3, 0), (5, 4).

Drawing Graphs to Meet Domain and Range Constraints

Task 3 / exact interval key

Sketch a function with domain [-1, 2] and range (-3, 1). Write the domain and range in interval notation.



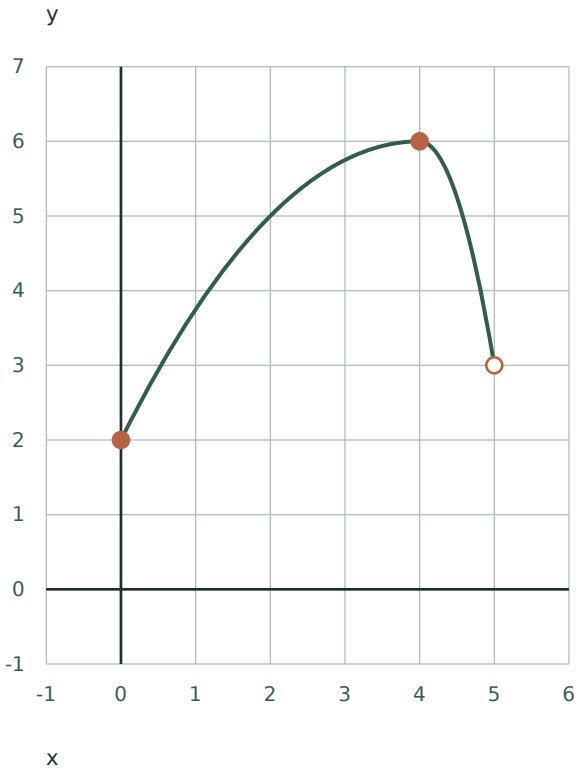
Each horizontal interval = 1; each vertical interval = 1. The axes show a display window, not a newly imposed domain.

Open circles: (-1, -3), (2, 1). Included points: (-1, 0), (2, 0).

Drawing Graphs to Meet Domain and Range Constraints

Task 4 / exact interval key

Sketch a function with domain [0, 5) and range [2, 6]. Write the domain and range in interval notation.



Each horizontal interval = 1; each vertical interval = 1. The axes show a display window, not a newly imposed domain.

Open circles: (5, 3). Included points: (0, 2), (4, 6).

Drawing Graphs to Meet Domain and Range Constraints

Original rubric / reflection

- [ ] Domain interval is correctly represented on the x-axis with appropriate open or closed endpoints.
- [ ] Range interval is correctly represented on the y-axis with appropriate open or closed endpoints.
- [ ] The graph is a function (passes the vertical line test) for all x in the domain.
- [ ] The graph covers the entire domain and stays within the range.
- [ ] Interval notation for domain and range is written correctly.
- [ ] Endpoints are marked with open circles for excluded endpoints and closed dots for included endpoints, consistent with interval notation.

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