Draw a Position-Time Graph from a Velocity-Time Graph

Original tasks 1, 2 / complete keys

Task 1

Velocity-time graph: 0 to 1 second, velocity 4 metres per second; 1 to 3 seconds, velocity 2 metres per second. Start at position 0 metres. Find positions at 1 second and 3 seconds and describe the two position-time segments.

Answer: At 1 second: position 4 metres. From 1 to 3 seconds: displacement 2 times 2 equals 4 metres, so position at 3 seconds is 8 metres. The first segment rises from 0 to 4 metres; the second rises from 4 to 8 metres with a gentler slope.

Reason: Displacement equals velocity times duration. First segment: 4 times 1 equals 4 metres. Second segment: 2 times 2 equals 4 metres; cumulative position 4 plus 4 equals 8 metres.

Check: Confirm the slope of the second segment is smaller than the first because 2 is less than 4, and verify final position equals 4 plus 4.

Task 2

Velocity-time graph: 0 to 2 seconds, velocity 1 metre per second; 2 to 5 seconds, velocity 0 metres per second. Start at position 2 metres. Find positions at 2 seconds and 5 seconds and describe the curve.

Answer: At 2 seconds: position 2 plus 1 times 2 equals 4 metres. From 2 to 5 seconds: displacement 0 times 3 equals 0 metres, so position stays at 4 metres. The curve rises from 2 to 4 metres, then is horizontal at 4 metres.

Reason: Accumulate displacement from the starting position. Zero velocity means no change in position.

Check: Check that the horizontal segment has zero slope and that the final position equals the starting position plus total displacement.

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Original tasks 3, 4 / complete keys

Task 3

Velocity-time graph: 0 to 3 seconds, velocity negative 2 metres per second; 3 to 4 seconds, velocity 1 metre per second. Start at position 10 metres. Find positions at 3 seconds and 4 seconds and describe the slope changes.

Answer: At 3 seconds: position 10 plus negative 2 times 3 equals 4 metres. From 3 to 4 seconds: displacement 1 times 1 equals 1 metre, so position at 4 seconds is 5 metres. The curve slopes downward from 10 to 4 metres, then slopes upward from 4 to 5 metres.

Reason: Negative velocity decreases position; positive velocity increases it. Compute each displacement and add cumulatively.

Check: Verify the downward segment has negative slope and the upward segment has positive slope, and that the curve is continuous at 3 seconds.

Task 4

Velocity-time graph: 0 to 2 seconds, velocity 2 metres per second; 2 to 4 seconds, velocity negative 1 metre per second; 4 to 5 seconds, velocity 0 metres per second. Start at position 0 metres. Find positions at 2, 4, and 5 seconds and describe the full curve.

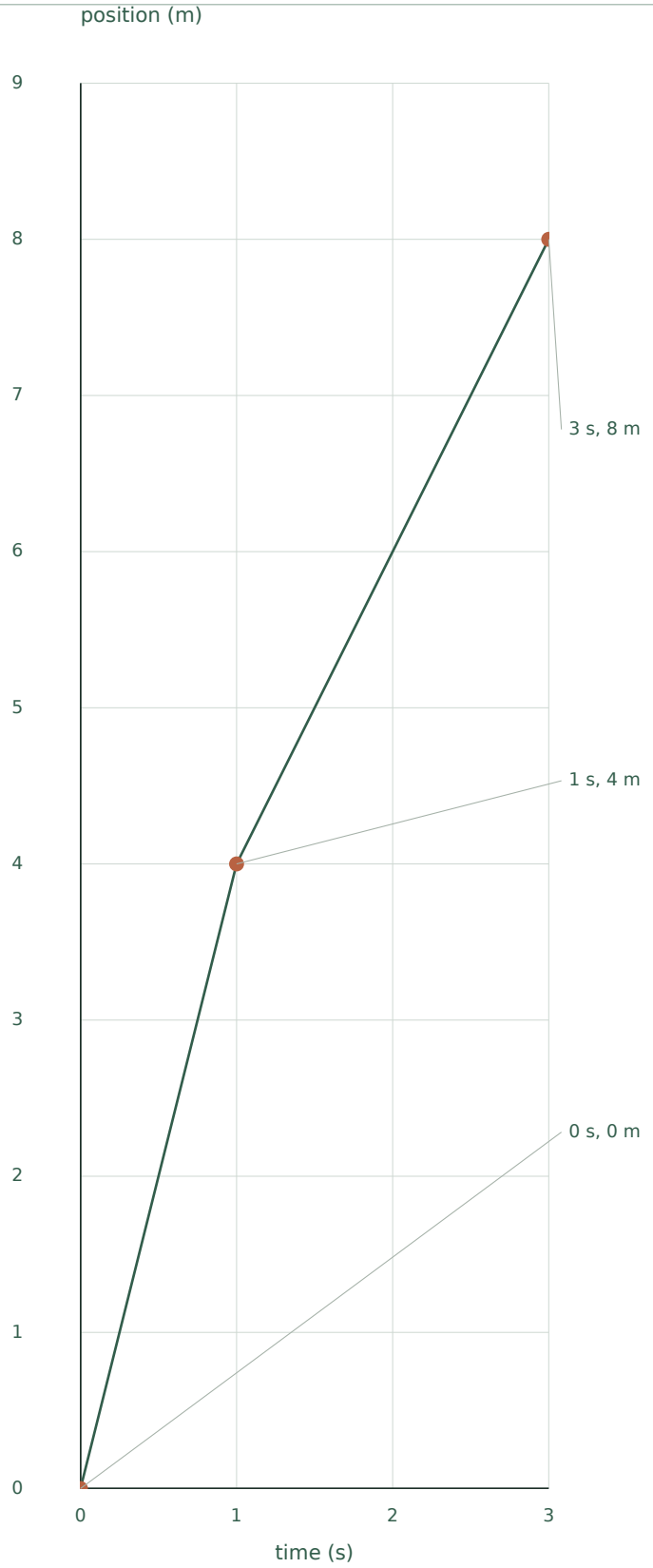
Answer: At 2 seconds: position 4 metres. From 2 to 4 seconds: displacement negative 1 times 2 equals negative 2 metres, so position at 4 seconds is 2 metres. From 4 to 5 seconds: displacement 0 times 1 equals 0 metres, so position stays at 2 metres. The curve rises to 4 metres, slopes downward to 2 metres, then is horizontal at 2 metres.

Reason: Sum displacements segment by segment: 4, then negative 2, then 0. Keep the curve continuous and change slope only at 2 and 4 seconds.

Check: Confirm final position equals 4 minus 2 plus 0 equals 2 metres, and that slope signs match velocity signs for all three segments.

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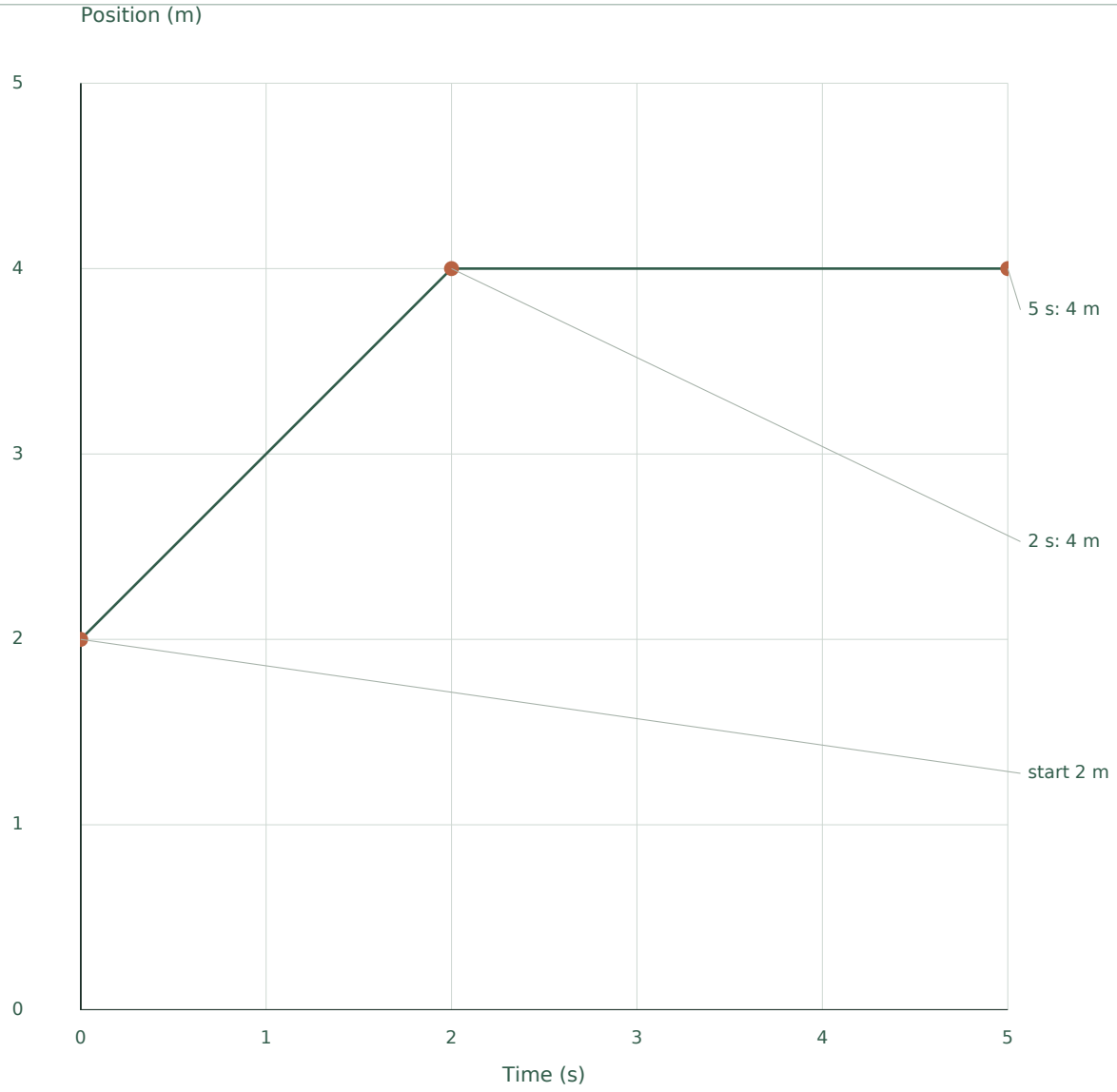
Position-time graph (reference answer)



Reference position-time graph: slope 4 m/s from 0 to 1 s, then slope 2 m/s from 1 to 3 s. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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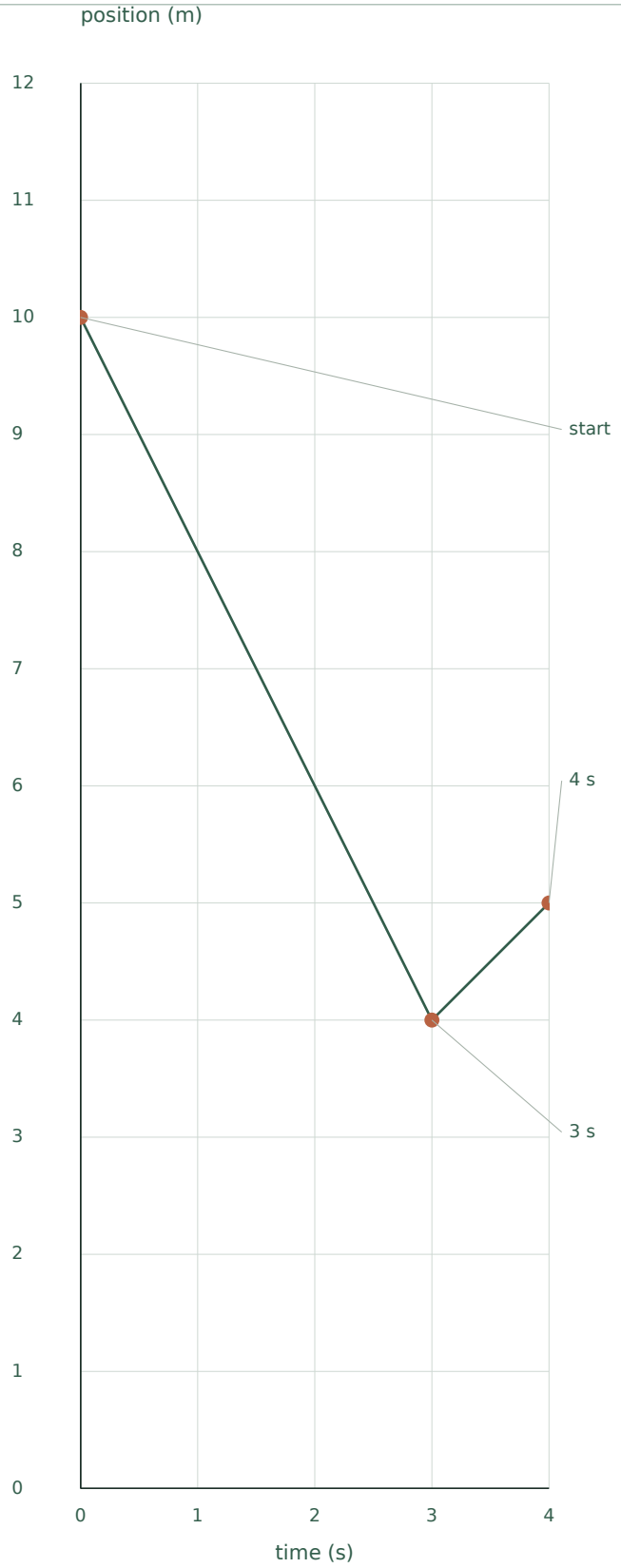
Position-time graph (reference)



Reference position-time curve: slope 1 m/s from 0 to 2 s, then zero slope from 2 to 5 s. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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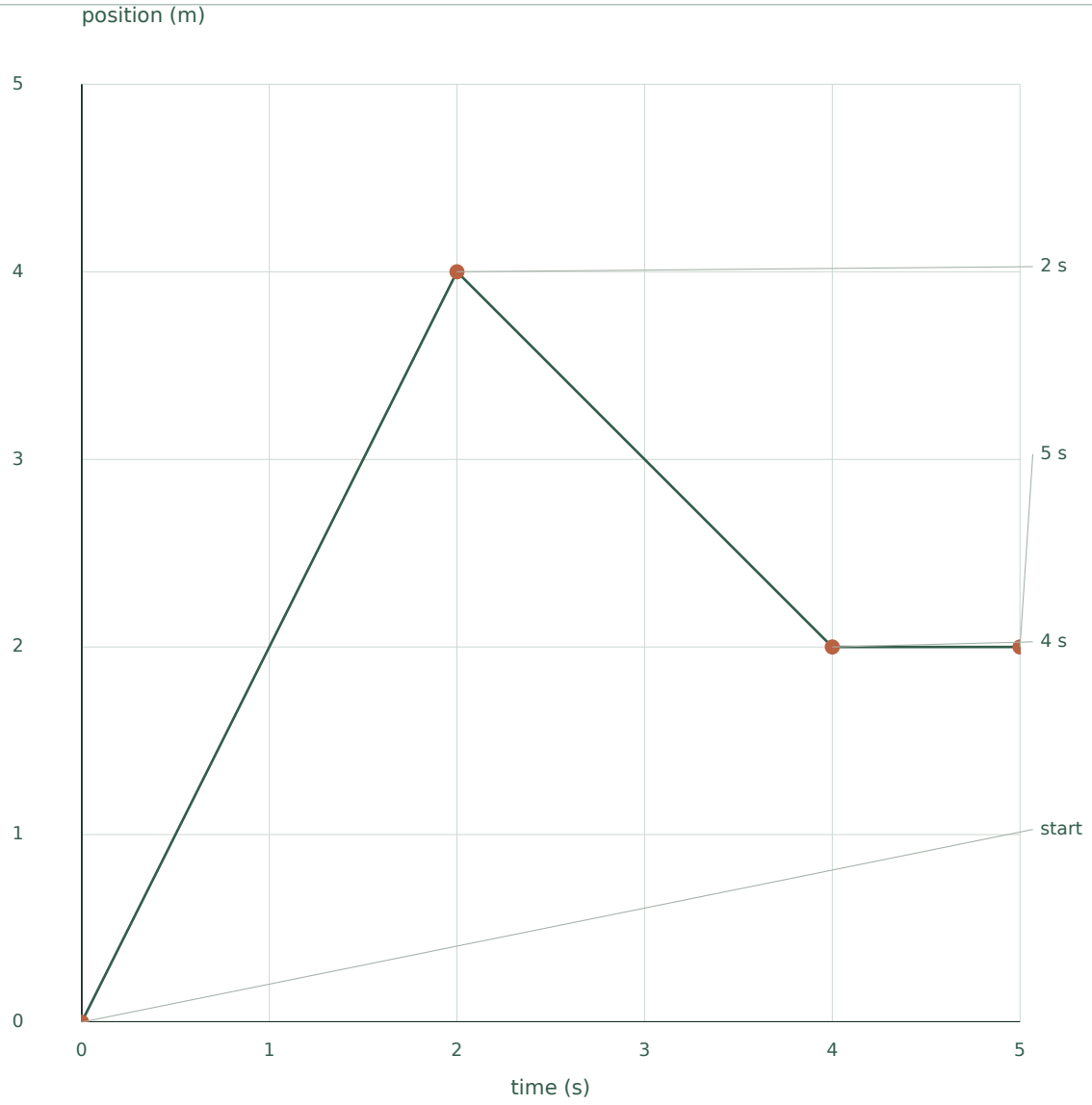
Position-time graph (reference)



Reference position-time curve: downward slope 0-3 s, upward slope 3-4 s, continuous at 3 s. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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Position-time graph (reference answer)



Reference position-time curve: rises to 4 m at 2 s, slopes down to 2 m at 4 s, horizontal at 2 m to 5 s. Coordinate labels sit outside the plot; thin grey leaders are annotations, not function curves.

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Source rubric / reflection

- [ ] Axes are labeled with time and position units and equal time intervals.
- [ ] Start position is marked and each segment displacement is computed correctly.
- [ ] Position-time curve is continuous with no vertical jumps.
- [ ] Each segment is straight and its slope sign matches the velocity sign.
- [ ] Final position equals the sum of all segment displacements.
- [ ] Alternative valid conventions are accepted if clearly stated and consistently applied.

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