Identify Dependent Systems by Graphing Coincident Lines

Original tasks 1, 2, 3 / complete keys

Task 1

Graph y = 2x + 1 and 4x - 2y = -2. Decide whether the system is dependent. Confirm algebraically.

Answer: Dependent; the lines coincide and there are infinitely many solutions.

Reason: Rewrite 4x - 2y = -2: subtract 4x to get -2y = -4x - 2, then divide by -2 to get y = 2x + 1. Both equations are y = 2x + 1, so slopes are both 2 and y-intercepts are both 1. Plotting points such as (0, 1), (1, 3), and (2, 5) for each equation gives the same line. Multiplying y = 2x + 1 by 2 gives 2y = 4x + 2, which rearranges to 4x - 2y = -2, confirming dependence.

Check: Substitute (1, 3) into both equations: 3 = 2(1) + 1 is true, and 4(1) - 2(3) = -2 is true. Substitute (2, 5): 5 = 2(2) + 1 is true, and 4(2) - 2(5) = -2 is true.

Task 2

Graph x + y = 3 and 2x + 2y = 6. Are the lines coincident? Show an algebraic check.

Answer: Yes, the lines are coincident; the system is dependent with infinitely many solutions.

Reason: Rewrite x + y = 3 as y = -x + 3. Rewrite 2x + 2y = 6 by dividing by 2 to get x + y = 3, then y = -x + 3. Both lines have slope -1 and y-intercept 3. Plotting (0, 3), (1, 2), and (2, 1) for each equation places all points on the same line. The second equation is exactly 2 times the first, so the equations are dependent.

Check: Check (1, 2): 1 + 2 = 3 is true, and 2(1) + 2(2) = 6 is true. Check (2, 1): 2 + 1 = 3 is true, and 2(2) + 2(1) = 6 is true.

Task 3

Graph y = -0.5x + 4 and x + 2y = 8. Determine whether the system is dependent and explain how the graph shows it.

Answer: Dependent; the lines coincide and there are infinitely many solutions.

Reason: Rewrite x + 2y = 8: subtract x to get 2y = -x + 8, then divide by 2 to get y = -0.5x + 4. Both equations have slope -0.5 and y-intercept 4. Plotting points such as (0, 4), (2, 3), and (4, 2) for each equation gives the same line. The graph shows one line because the two lines lie exactly on top of each other. Algebraically, multiplying y = -0.5x + 4 by 2 gives 2y = -x + 8, which rearranges to x + 2y = 8.

Check: Substitute (2, 3): 3 = -0.5(2) + 4 is true, and 2 + 2(3) = 8 is true. Substitute (4, 2): 2 = -0.5(4) + 4 is true, and 4 + 2(2) = 8 is true.

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Original tasks 4 / complete keys

Task 4

Graph 3x - y = 2 and 6x - 2y = 4. A student says the lines are parallel because the coefficients are doubled. Are they correct? Confirm with slopes and intercepts.

Answer: The student is incorrect; the lines coincide and the system is dependent with infinitely many solutions.

Reason: Rewrite 3x - y = 2 as y = 3x - 2. Rewrite 6x - 2y = 4: subtract 6x to get -2y = -6x + 4, then divide by -2 to get y = 3x - 2. Both lines have slope 3 and y-intercept -2, so they coincide. Doubling all coefficients and the constant produces an equivalent equation, not a parallel distinct line. Plotting (0, -2), (1, 1), and (2, 4) for each equation confirms one line.

Check: Check (1, 1): 3(1) - 1 = 2 is true, and 6(1) - 2(1) = 4 is true. Check (2, 4): 3(2) - 4 = 2 is true, and 6(2) - 2(4) = 4 is true.

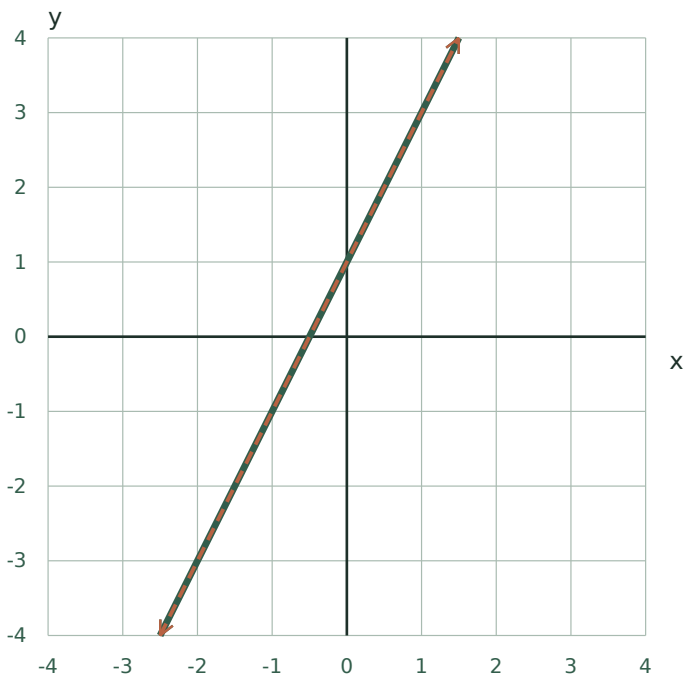
Identify Dependent Systems by Graphing Coincident Lines

Task 1 / completed source graph

Graph y = 2x + 1 and 4x - 2y = -2. Decide whether the system is dependent. Confirm algebraically.

Line 1 (solid green): y = 2x + 1

Line 2 (long-dashed orange): 4x - 2y = -2



Both equations have the SAME path: infinitely many common solutions.

Horizontal interval = 1; vertical interval = 1. This is a display window, not a new domain.

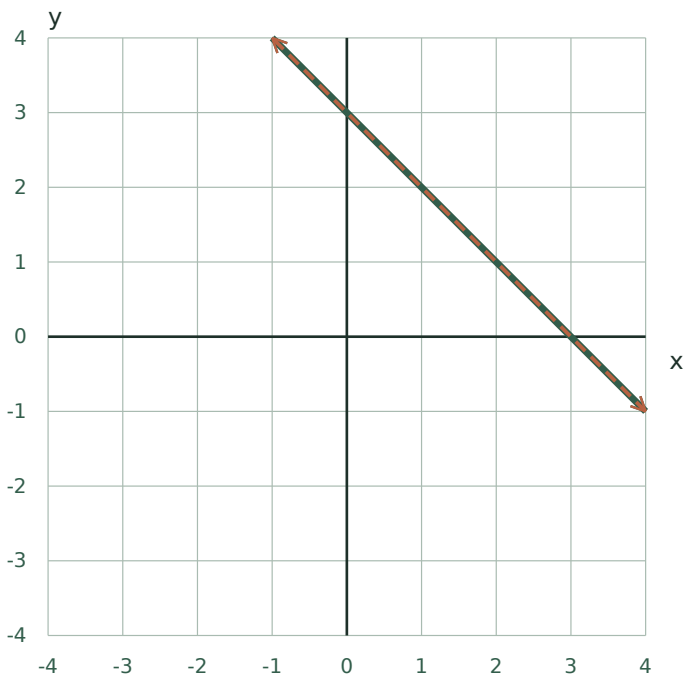
Identify Dependent Systems by Graphing Coincident Lines

Task 2 / completed source graph

Graph x + y = 3 and 2x + 2y = 6. Are the lines coincident? Show an algebraic check.

Line 1 (solid green): x + y = 3

Line 2 (long-dashed orange): 2x + 2y = 6



Both equations have the SAME path: infinitely many common solutions.

Horizontal interval = 1; vertical interval = 1. This is a display window, not a new domain.

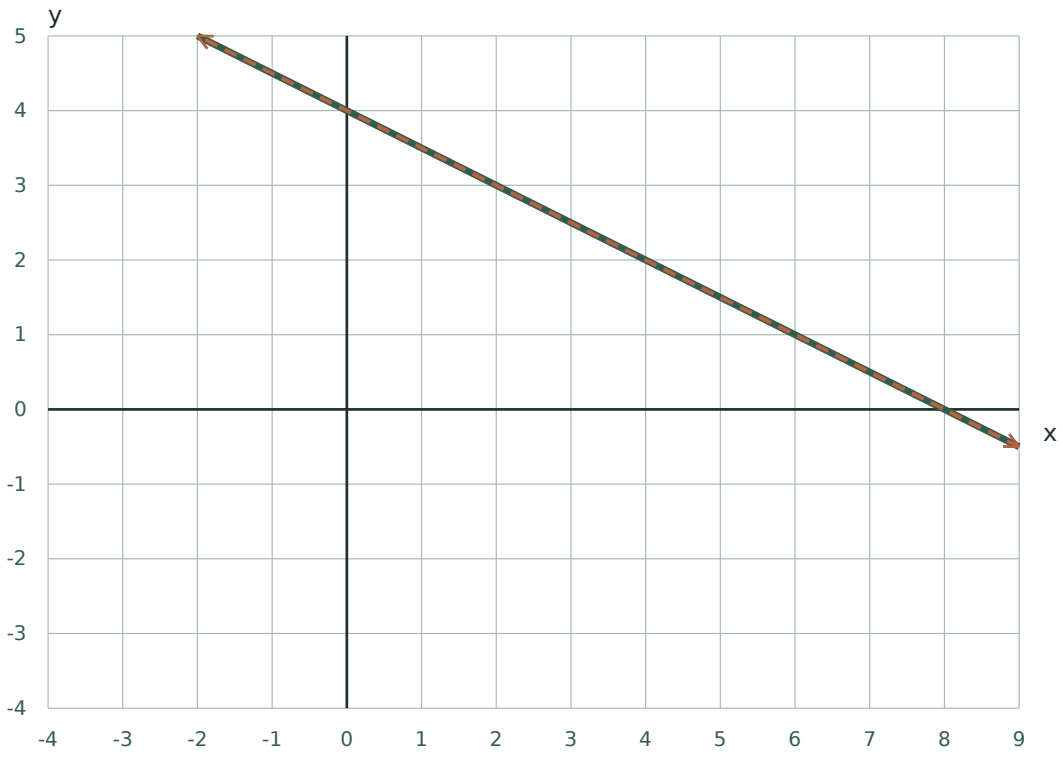
Identify Dependent Systems by Graphing Coincident Lines

Task 3 / completed source graph

Graph y = -0.5x + 4 and x + 2y = 8. Determine whether the system is dependent and explain how the graph shows it.

Line 1 (solid green): y = -0.5x + 4

Line 2 (long-dashed orange): x + 2y = 8



Both equations have the SAME path: infinitely many common solutions.

Horizontal interval = 1; vertical interval = 1. This is a display window, not a new domain.

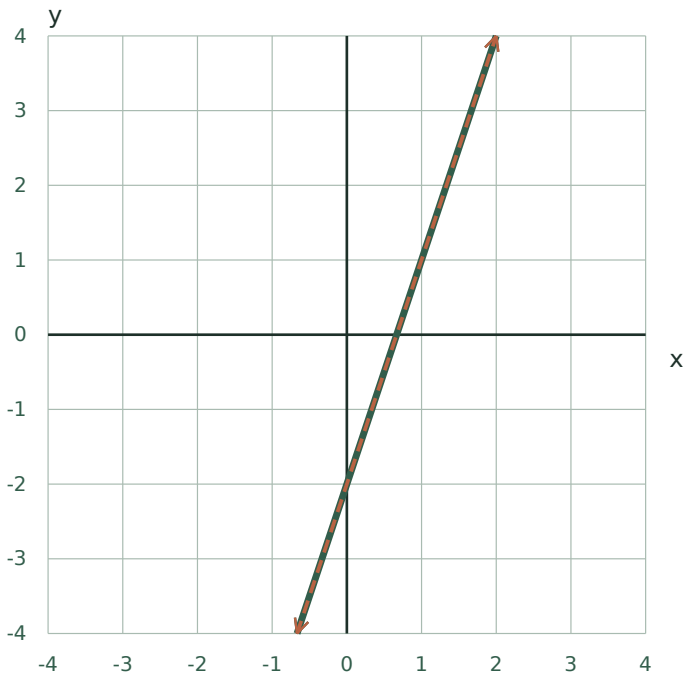
Identify Dependent Systems by Graphing Coincident Lines

Task 4 / completed source graph

Graph 3x - y = 2 and 6x - 2y = 4. A student says the lines are parallel because the coefficients are doubled. Are they correct? Confirm with slopes and intercepts.

Line 1 (solid green): 3x - y = 2

Line 2 (long-dashed orange): 6x - 2y = 4



Both equations have the SAME path: infinitely many common solutions.

Horizontal interval = 1; vertical interval = 1. This is a display window, not a new domain.

Identify Dependent Systems by Graphing Coincident Lines

Original rubric / reflection

- [ ] Correctly rewrites both equations in slope-intercept form or standard form.
- [ ] Compares slopes and intercepts accurately and states whether they are equal.
- [ ] Plots at least two points per equation on a consistent grid and describes the coincidence.
- [ ] Confirms algebraically that one equation is a nonzero multiple of the other.
- [ ] States the conclusion: dependent system with infinitely many solutions.
- [ ] Uses clear labels and consistent units; arithmetic is checkable and correct.

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