Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Complete worked example / separate answer key

Sketch the ellipse (x - 1)^2 / 16 + (y + 2)^2 / 9 = 1 on a coordinate grid. Identify the center and semi-axis lengths, then describe the sketch.

Answer: Center: (1, -2). Horizontal semi-axis a = 4; vertical semi-axis b = 3. Vertices: (5, -2), (-3, -2), (1, 1), (1, -5). The ellipse is wider horizontally. Sketch: plot center, mark vertices, draw a smooth closed curve through them, symmetric about x = 1 and y = -2.

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Original tasks 1, 2, 3 / complete keys

Task 1

Sketch (x - 2)^2 / 25 + (y - 1)^2 / 4 = 1. State the center, semi-axis lengths, and four vertices.

Answer: Center (2, 1); a = 5 horizontally, b = 2 vertically; vertices (7, 1), (-3, 1), (2, 3), (2, -1).

Reason: Denominators 25 and 4 give semi-axes 5 and 2. The x-term denominator is larger, so the ellipse is wider horizontally. Center from (x - 2) and (y - 1) is (2, 1).

Check: Substitute (7, 1): (7-2)^2/25 + (1-1)^2/4 = 25/25 + 0 = 1. Count grid squares from center to each vertex to confirm 5 and 2.

Task 2

Sketch (x + 3)^2 / 9 + (y - 4)^2 / 16 = 1. State the center, semi-axis lengths, and four vertices.

Answer: Center (-3, 4); a = 3 horizontally, b = 4 vertically; vertices (0, 4), (-6, 4), (-3, 8), (-3, 0).

Reason: Denominators 9 and 16 give semi-axes 3 and 4. The y-term denominator is larger, so the ellipse is taller vertically. Center from (x + 3) and (y - 4) is (-3, 4).

Check: Substitute (0, 4): (0+3)^2/9 + (4-4)^2/16 = 9/9 + 0 = 1. Verify vertical vertices are 4 units above and below center.

Task 3

Sketch x^2 / 36 + (y + 1)^2 / 36 = 1. State the center, semi-axis lengths, and four vertices. What shape is it?

Answer: Center (0, -1); a = 6, b = 6; vertices (6, -1), (-6, -1), (0, 5), (0, -7). It is a circle of radius 6.

Reason: Both denominators are 36, so semi-axes are equal. The equation represents a circle centered at (0, -1).

Check: Substitute (6, -1): 36/36 + 0 = 1. Confirm all four vertices are 6 units from center.

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Original tasks 4 / complete keys

Task 4

Sketch (x - 0)^2 / 4 + (y - 0)^2 / 1 = 1, i.e., x^2/4 + y^2/1 = 1. State the center, semi-axis lengths, and four vertices.

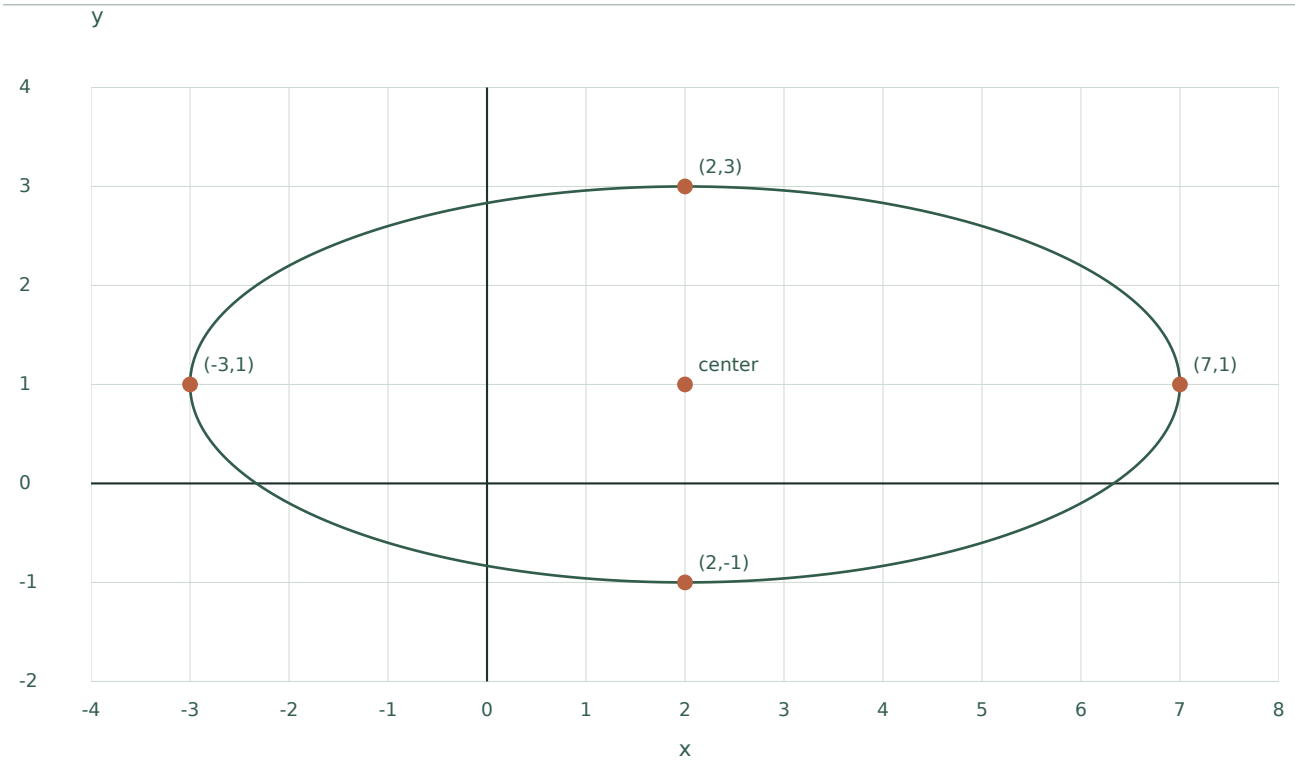
Answer: Center (0, 0); a = 2 horizontally, b = 1 vertically; vertices (2, 0), (-2, 0), (0, 1), (0, -1).

Reason: Denominators 4 and 1 give semi-axes 2 and 1. The ellipse is wider horizontally and centered at the origin.

Check: Substitute (2, 0): 4/4 + 0 = 1. Count 2 squares right/left and 1 square up/down from origin.

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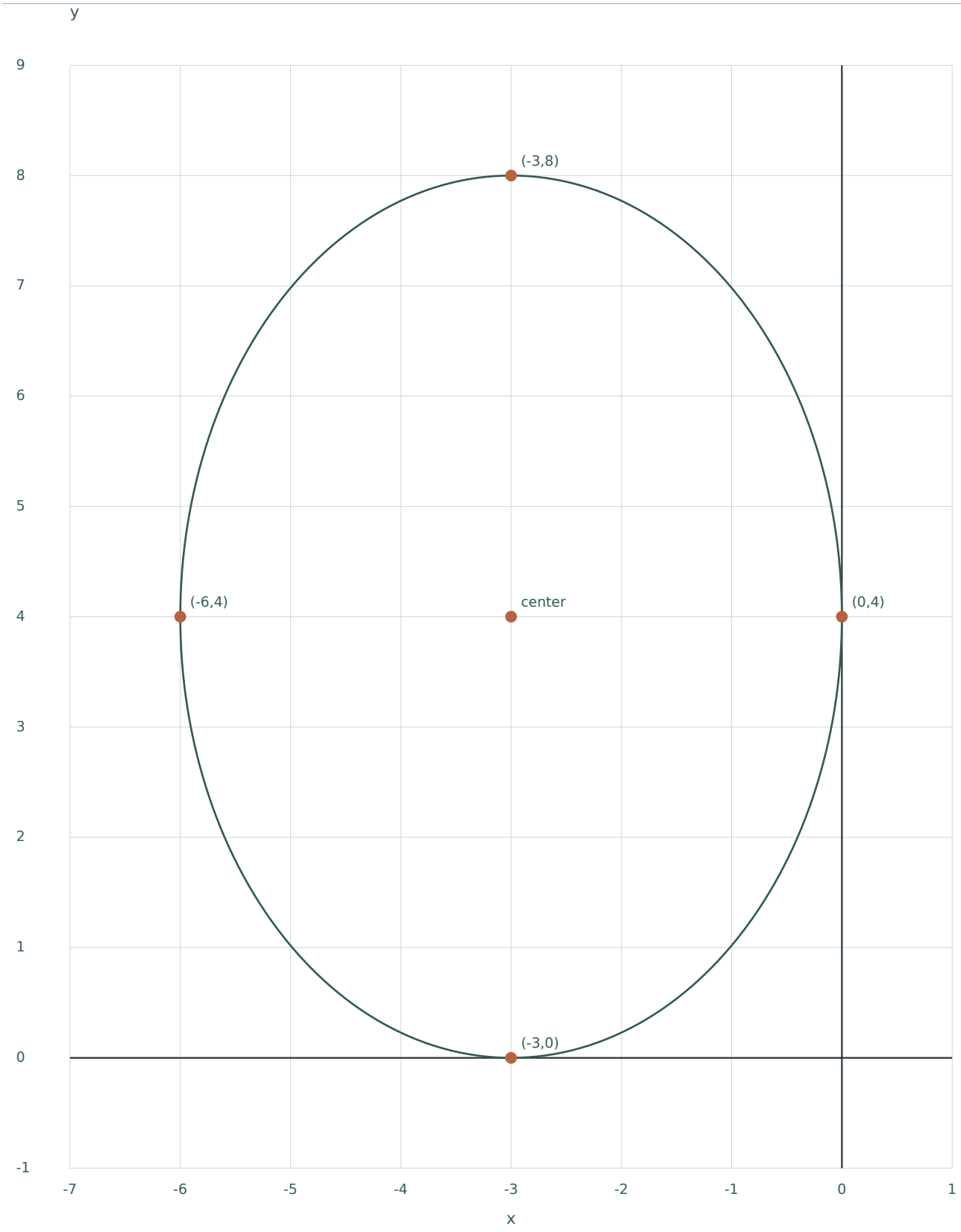
Task 1 / Exercise 1 reference graph



a=5, b=2.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

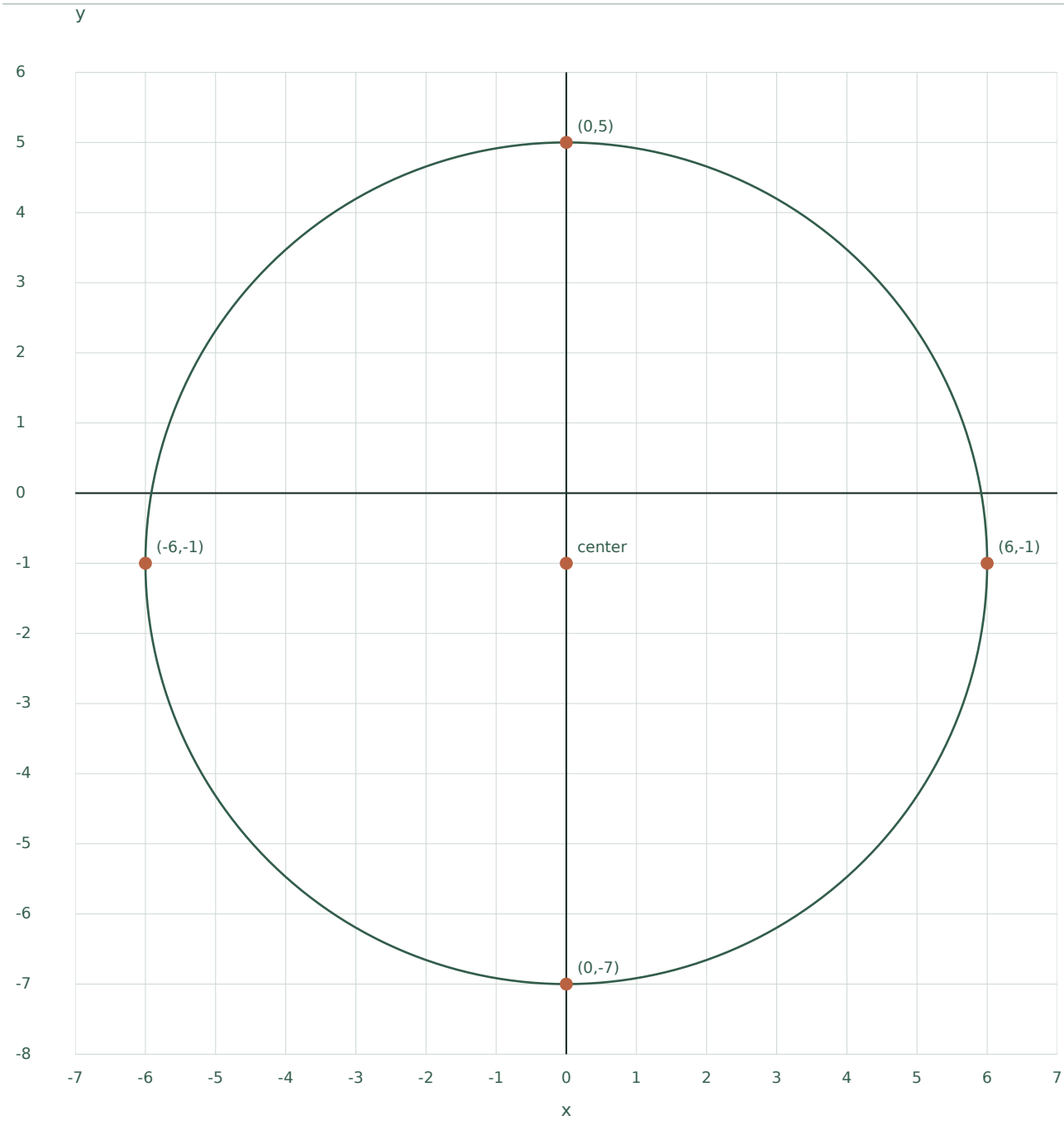
Task 2 / Exercise 2 reference graph



a=3, b=4.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Task 3 / Exercise 3 reference graph



Circle radius 6.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Task 4 / Exercise 4 reference graph



a=2, b=1.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Task 1, Task 2, Task 3, Task 4 / Answer key

Complete answers and check methods for all four exercises.

Exercise 1: Center (2,1); a=5 horizontally, b=2 vertically; vertices (7,1),(-3,1),(2,3),(2,-1). Reasoning: denominators 25 and 4 give semi-axes 5 and 2; x-term denominator larger so wider horizontally. Check: substitute (7,1): (7-2)^2/25+(1-1)^2/4=25/25+0=1.

Exercise 2: Center (-3,4); a=3 horizontally, b=4 vertically; vertices (0,4),(-6,4),(-3,8),(-3,0). Reasoning: denominators 9 and 16 give semi-axes 3 and 4; y-term denominator larger so taller vertically. Check: substitute (0,4): (0+3)^2/9+(4-4)^2/16=9/9+0=1.

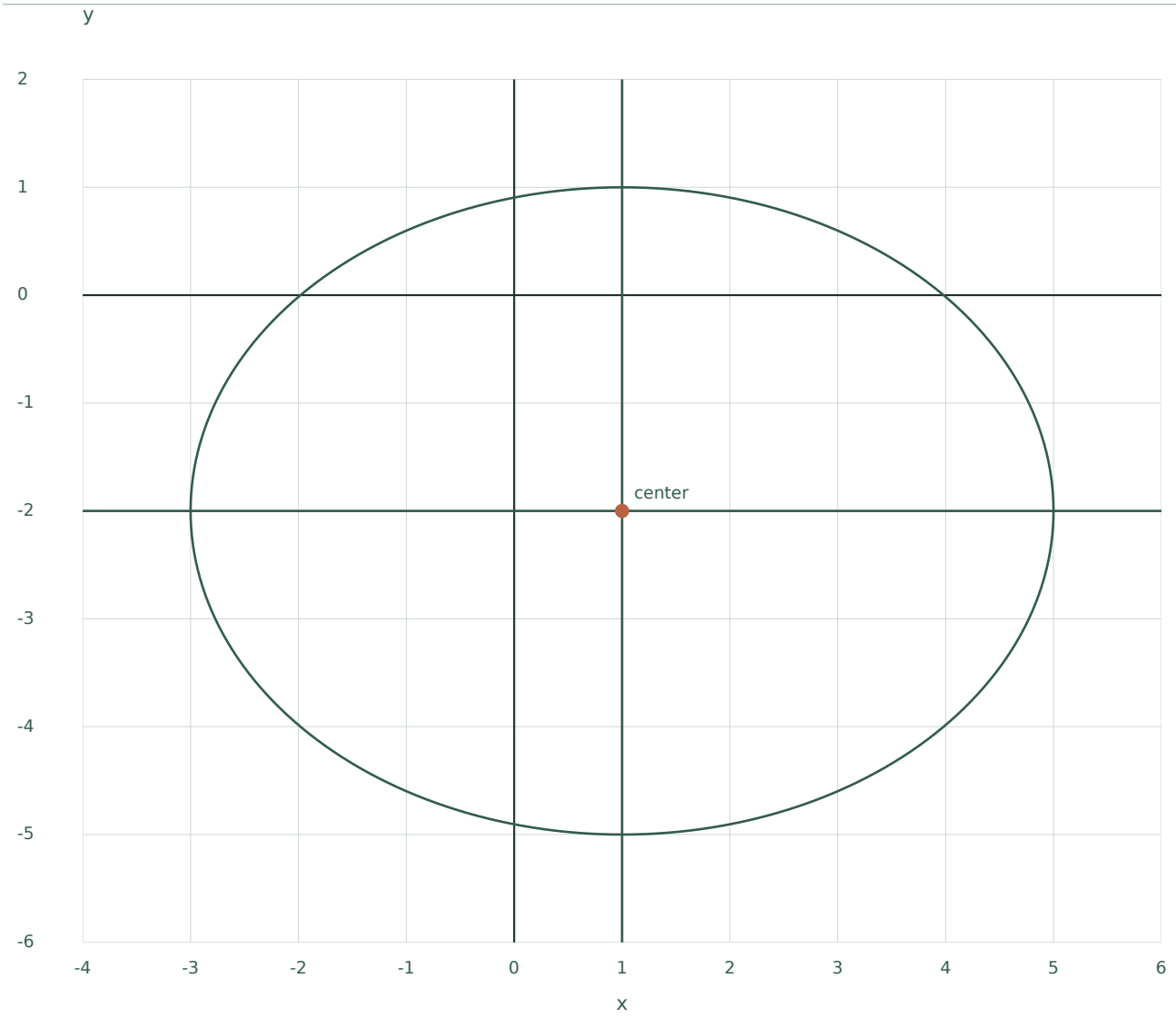
Exercise 3: Center (0,-1); a=6, b=6; vertices (6,-1),(-6,-1),(0,5),(0,-7). It is a circle of radius 6. Reasoning: both denominators 36 give equal semi-axes. Check: substitute (6,-1): 36/36+0=1.

Exercise 4: Center (0,0); a=2 horizontally, b=1 vertically; vertices (2,0),(-2,0),(0,1),(0,-1). Reasoning: denominators 4 and 1 give semi-axes 2 and 1; wider horizontally. Check: substitute (2,0): 4/4+0=1.

Rubric: center correctly identified; semi-axis lengths correctly computed as square roots; four vertices correctly plotted; curve smooth, closed, through all four vertices; symmetric about center lines; axes and scale labeled; valid alternative hand-drawn shapes accepted if vertices and symmetry correct.

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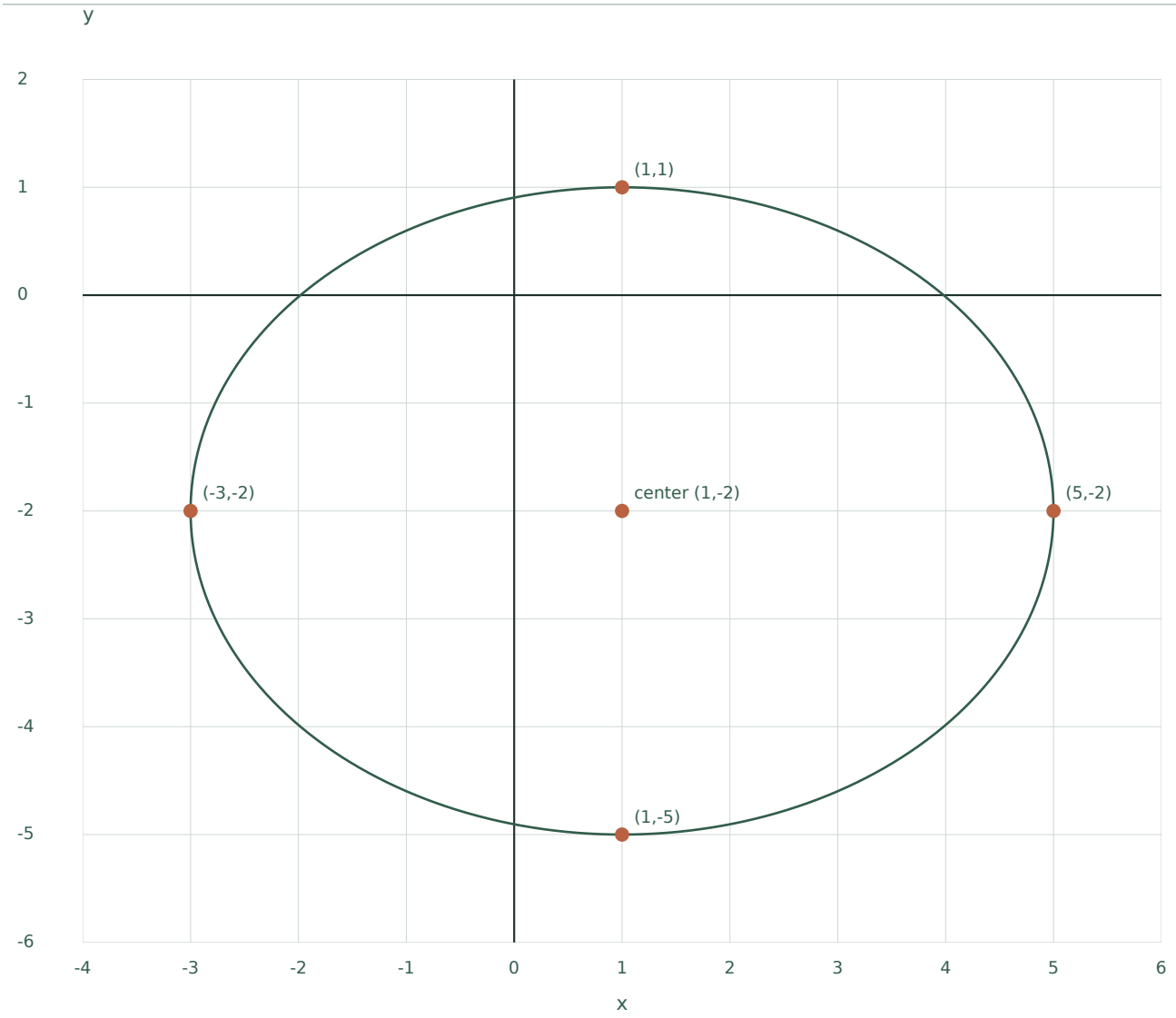
Worked example / Worked example with symmetry lines



Symmetry about x=1 and y=-2.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Worked example / Worked example: (x - 1)^2/16 + (y + 2)^2/9 = 1



Semi-axis lengths labeled: a=4 horizontally, b=3 vertically. Symmetry lines x=1 and y=-2.

Sketch an Ellipse from Its Equation: Center, Semi-Axes, and Grid

Source rubric / reflection

- [ ] Center correctly identified from the equation.
- [ ] Both semi-axis lengths correctly computed as square roots of denominators.
- [ ] Four vertices correctly plotted at (h ± a, k) and (h, k ± b).
- [ ] Curve is smooth, closed, and passes through all four vertices.
- [ ] Sketch is symmetric about the vertical and horizontal lines through the center.
- [ ] Grid axes and scale are labeled; units are consistent.
- [ ] Valid alternative hand-drawn shapes are accepted if vertices and symmetry are correct.

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