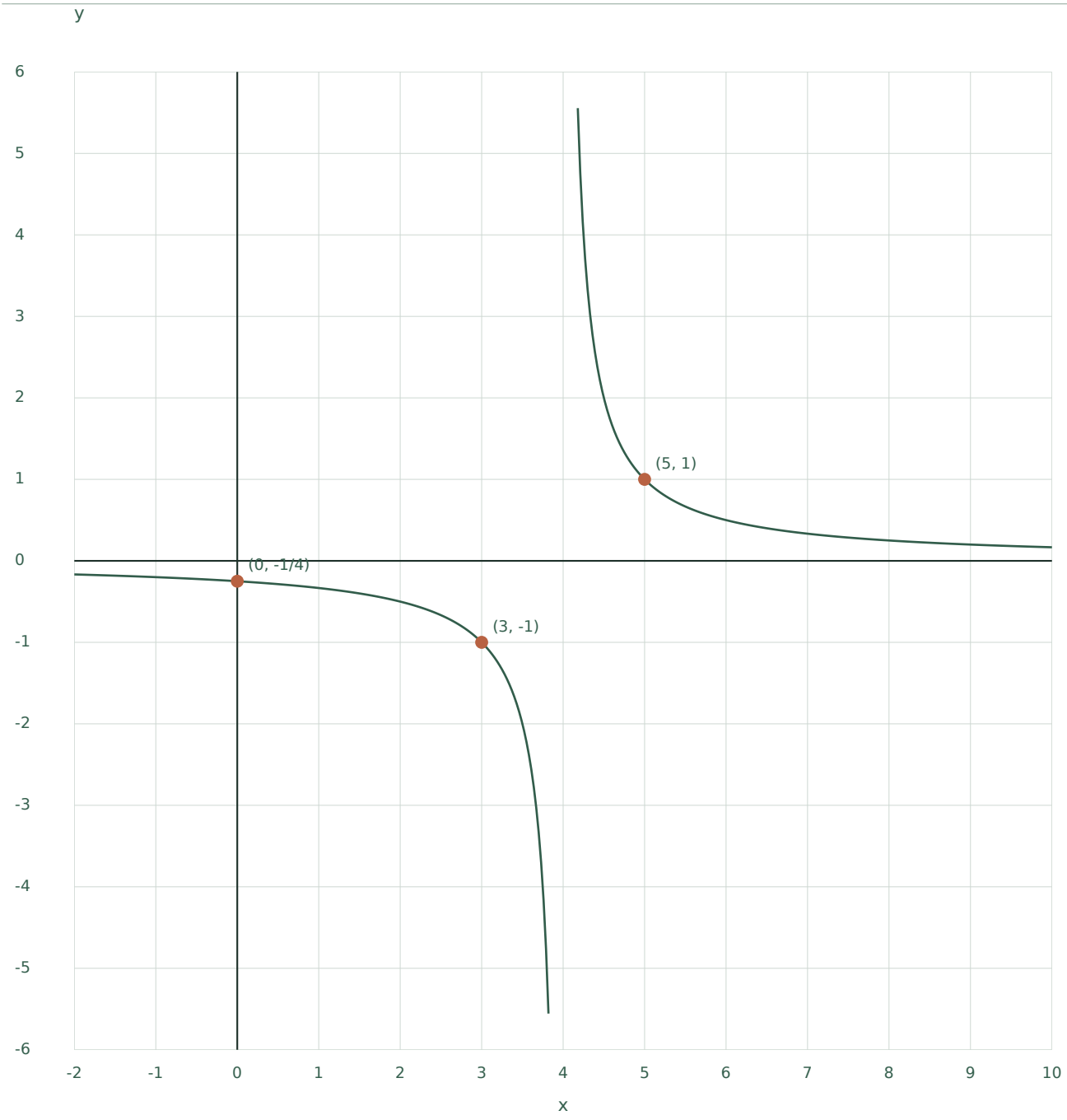
Graph Rational Functions: Vertical and Horizontal Asymptotes

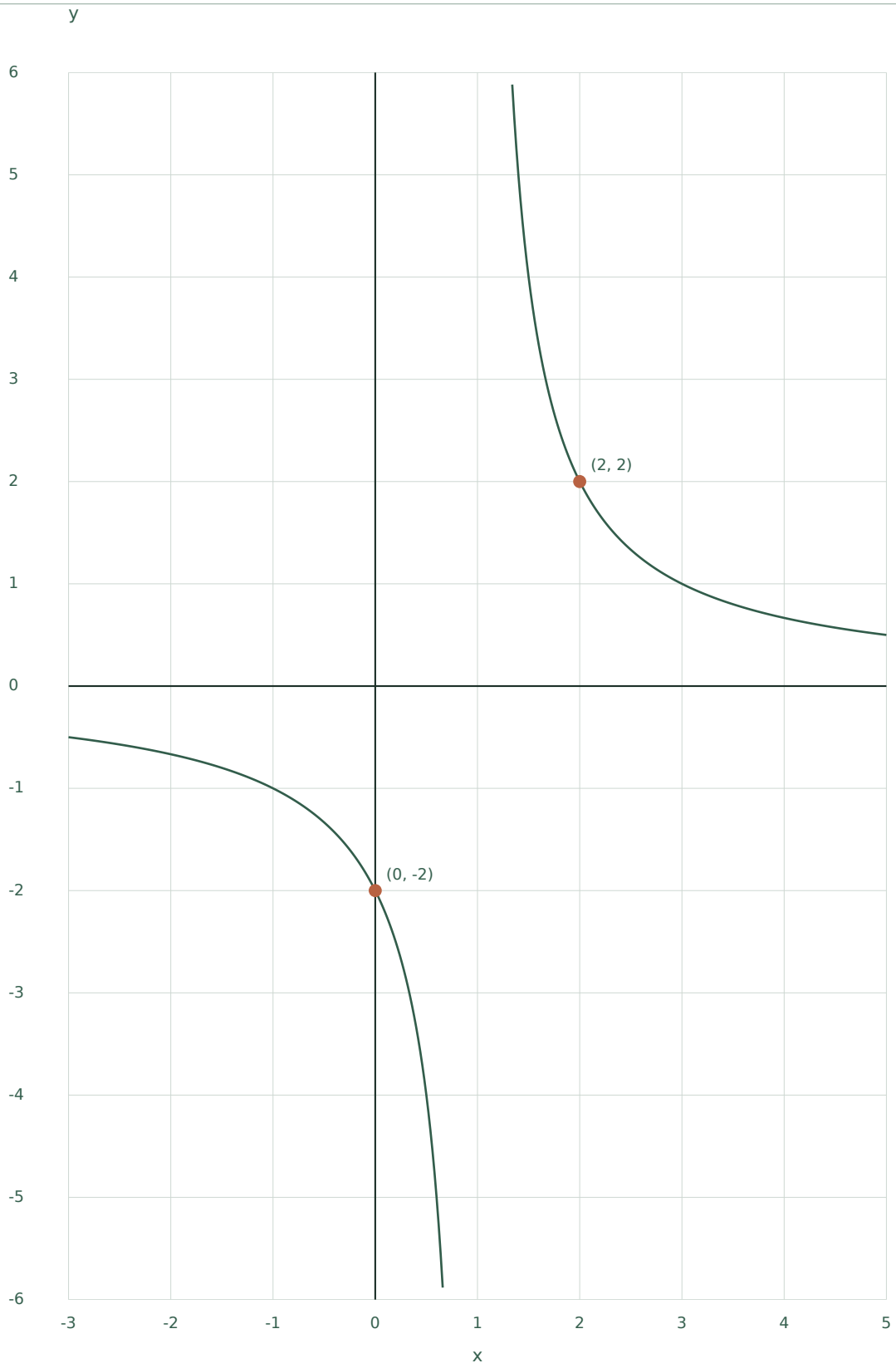
Worked Example: y = 1/(x-4)



Dashed asymptotes x = 4 and y = 0 are shown as guide lines; branches approach but do not cross x = 4.

Graph Rational Functions: Vertical and Horizontal Asymptotes

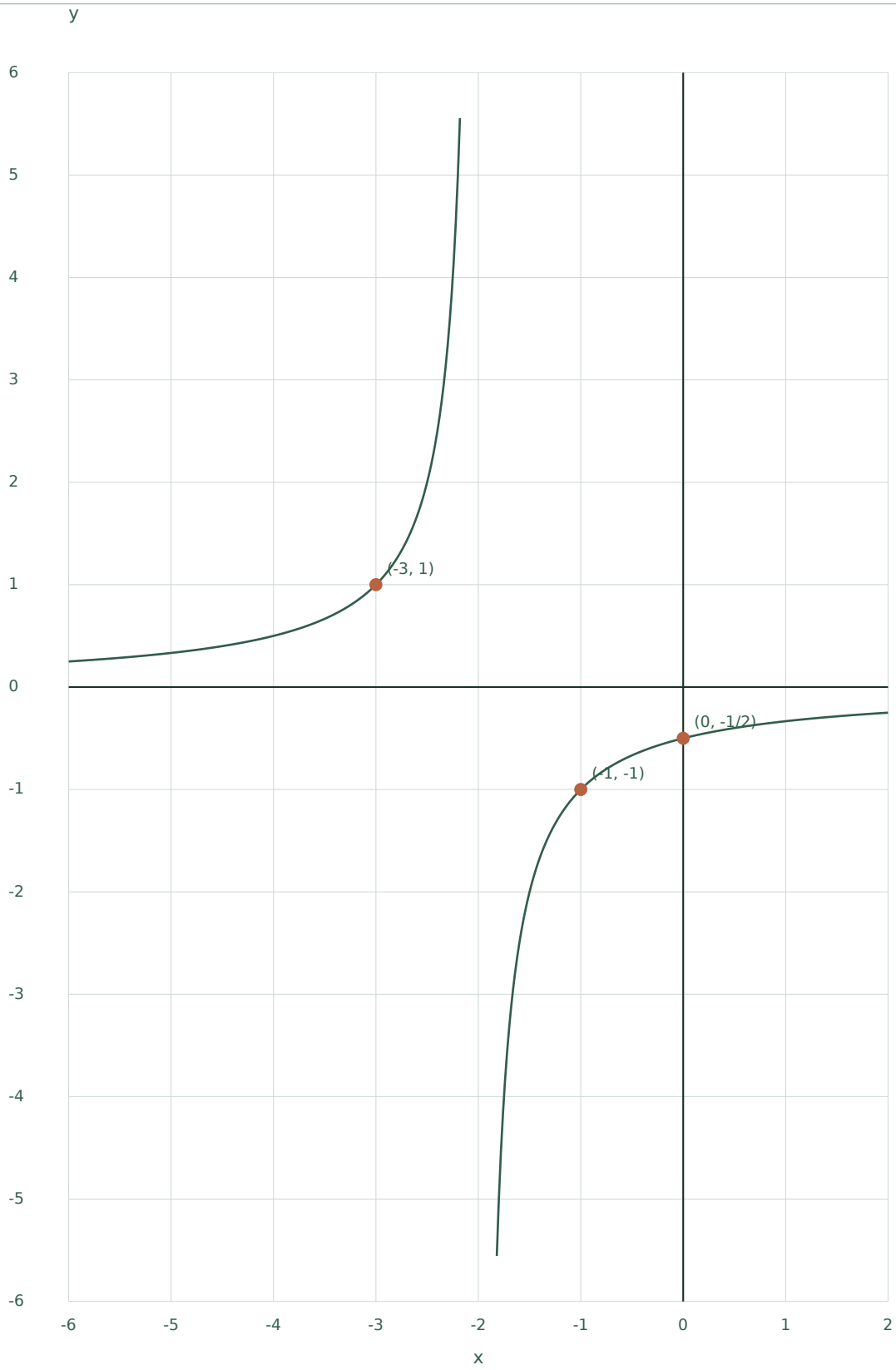
Answer Key Exercise 1: y = 2/(x-1)



Vertical asymptote x = 1; horizontal asymptote y = 0; no x-intercept.

Graph Rational Functions: Vertical and Horizontal Asymptotes

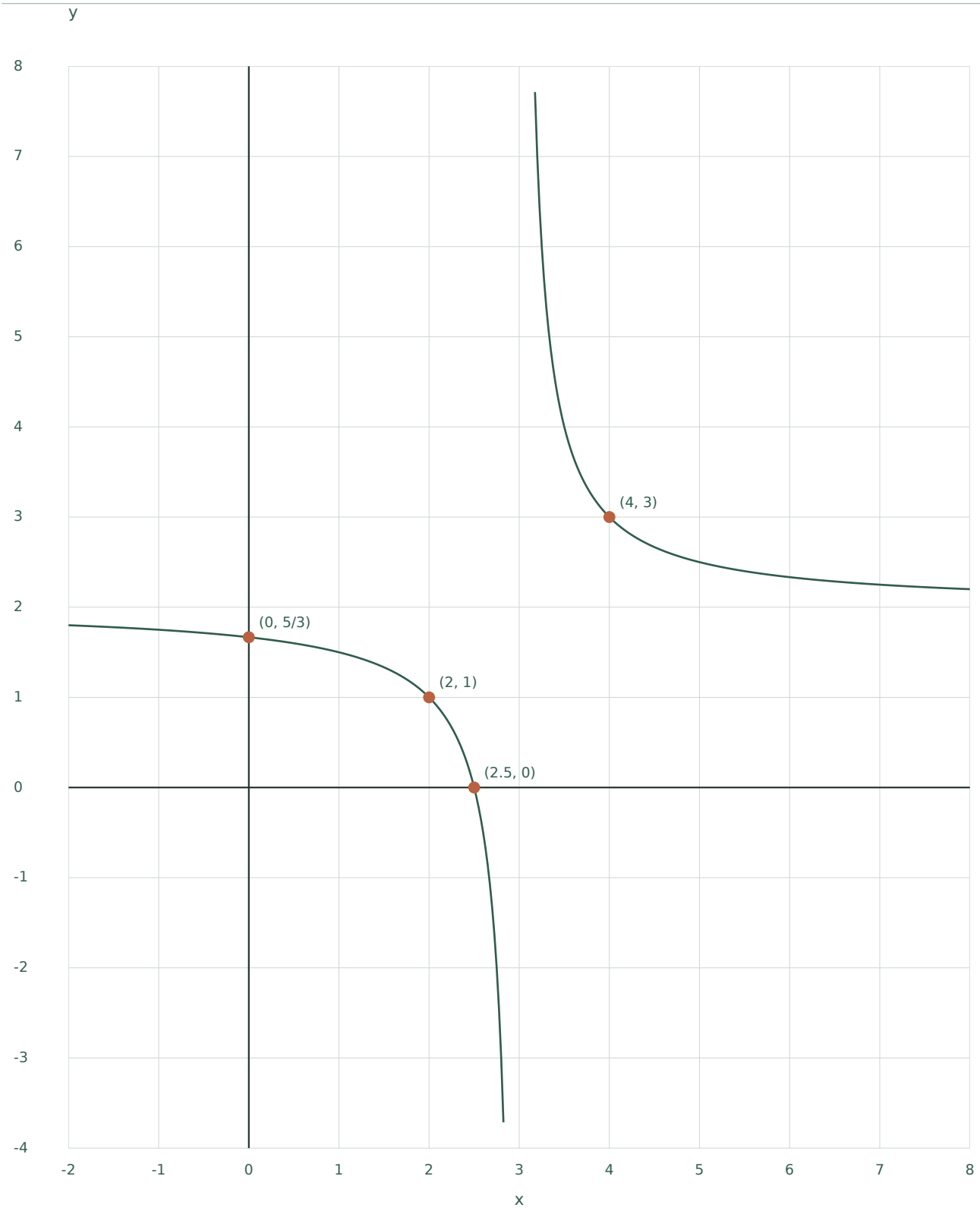
Answer Key Exercise 2: y = -1/(x+2)



Vertical asymptote x = -2; horizontal asymptote y = 0; no x-intercept.

Graph Rational Functions: Vertical and Horizontal Asymptotes

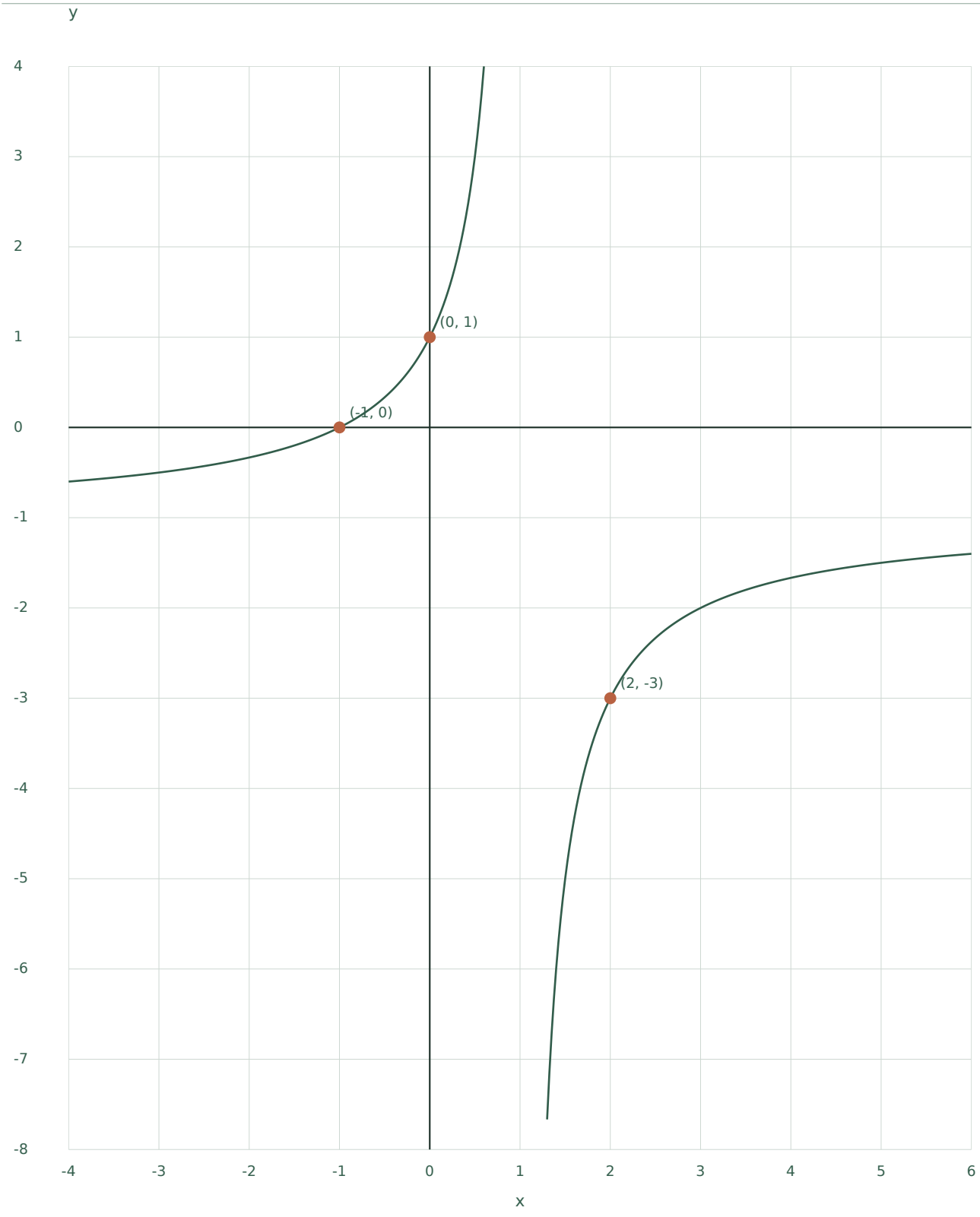
Answer Key Exercise 3: y = 1/(x-3) + 2



Vertical asymptote x = 3; horizontal asymptote y = 2.

Graph Rational Functions: Vertical and Horizontal Asymptotes

Answer Key Exercise 4: y = -2/(x-1) - 1



Vertical asymptote x = 1; horizontal asymptote y = -1.

Graph Rational Functions: Vertical and Horizontal Asymptotes

Answer Key: Asymptotes, Intercepts, and Branch Descriptions

Text key for the four exercises and rubric criteria.

Exercise 1: y = 2/(x-1). Vertical asymptote x = 1; horizontal asymptote y = 0; y-intercept (0, -2); no x-intercept. For x > 1, y is positive and approaches positive infinity as x approaches 1 from the right. For x < 1, y is negative and approaches negative infinity as x approaches 1 from the left. Both branches approach y = 0 at the far ends.

Exercise 2: y = -1/(x+2). Vertical asymptote x = -2; horizontal asymptote y = 0; y-intercept (0, -1/2); no x-intercept. For x > -2, y is negative and approaches negative infinity as x approaches -2 from the right. For x < -2, y is positive and approaches positive infinity as x approaches -2 from the left. Both branches approach y = 0 at the far ends.

Exercise 3: y = 1/(x-3) + 2. Vertical asymptote x = 3; horizontal asymptote y = 2; y-intercept (0, 5/3); x-intercept (2.5, 0). For x > 3, y is above 2 and approaches positive infinity as x approaches 3 from the right. For x < 3, y is below 2 and approaches negative infinity as x approaches 3 from the left. Both branches approach y = 2 at the far ends.

Exercise 4: y = -2/(x-1) - 1. Vertical asymptote x = 1; horizontal asymptote y = -1; y-intercept (0, 1); x-intercept (-1, 0). For x > 1, y is below -1 and approaches negative infinity as x approaches 1 from the right. For x < 1, y is above -1 and approaches positive infinity as x approaches 1 from the left. Both branches approach y = -1 at the far ends.

Rubric: (1) Vertical asymptote correctly identified and drawn as a dashed line. (2) Horizontal asymptote correctly identified and drawn as a dashed line. (3) Intercepts computed accurately and plotted at correct coordinates. (4) Branches placed on correct sides of the vertical asymptote with correct sign relative to the horizontal asymptote. (5) End behavior near asymptotes matches the function's values. (6) Graph does not cross the vertical asymptote. (7) Test points used to