Name: _____ Date: _____ Period: _____

Show all reasoning. Label holes, vertical asymptotes (VA), intercepts, and one-sided limits precisely.

1. Identify holes and vertical asymptotes. State the x-value of each.

$f(x) = \dfrac{(x - 7)(x + 4)}{(x + 4)(x - 2)}$

2. Identify any holes and vertical asymptotes.

$g(x) = \dfrac{x^2 - 16}{x^2 + 2x - 24}$

3. Identify all discontinuities and classify each as a hole or VA.

$h(x) = \dfrac{(x-3)^2(x+1)}{(x-3)(x+5)}$

4. Does this function have any holes or vertical asymptotes? Explain.

$p(x) = \dfrac{x^2+4}{x^2-9}$

5. Write the left-hand and right-hand infinite limits at the vertical asymptote.

$f(x) = \dfrac{x + 2}{x - 5}$

6. Write the left-hand and right-hand infinite limits at the vertical asymptote.

$g(x) = \dfrac{-3}{(x + 2)^2}$

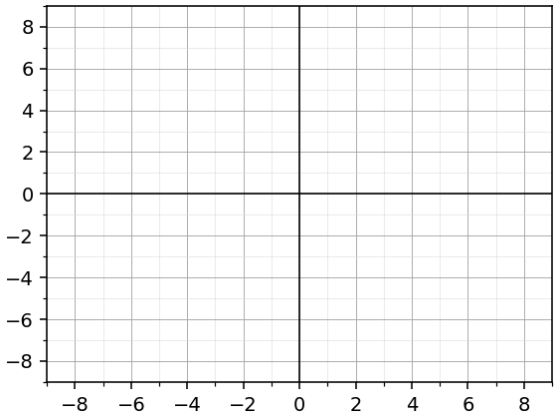
7. Complete a calculator-style table near x = 1. Determine the VA and both one-sided limits.

$r(x) = \dfrac{x + 3}{x - 1}$

x	0.9	0.99	0.999	1	1.001	1.01	1.1
f(x)							

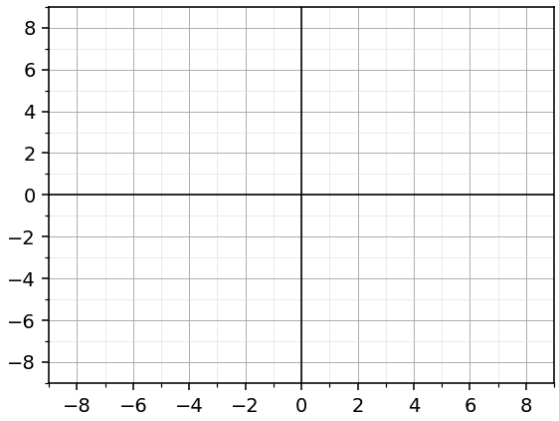
8. Graph the rational function on the grid. State every vertical asymptote and its one-sided limits.

$f(x) = \dfrac{2}{(x + 3)(x - 2)}$



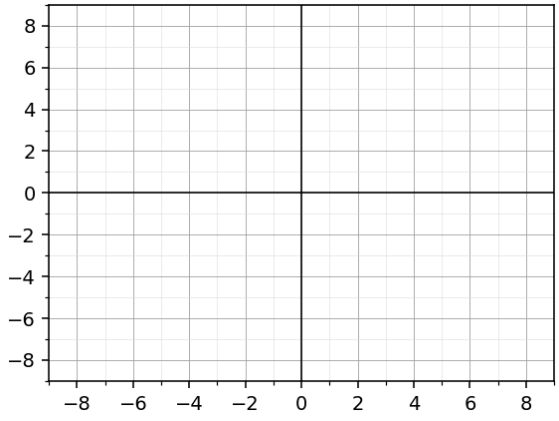
9. Construct one rational function with a hole at $x = -2$ and vertical asymptotes at $x = 1$ and $x = 5$.

Use factored form.



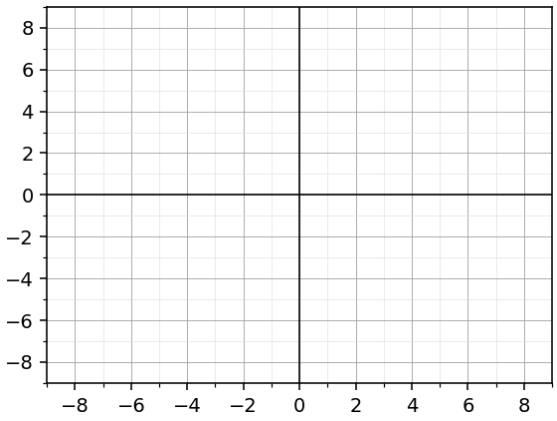
10. Construct one rational function with a hole at $x = 4$, a vertical asymptote at $x = -1$, and an x-intercept at $x = 3$.

Use factored form.



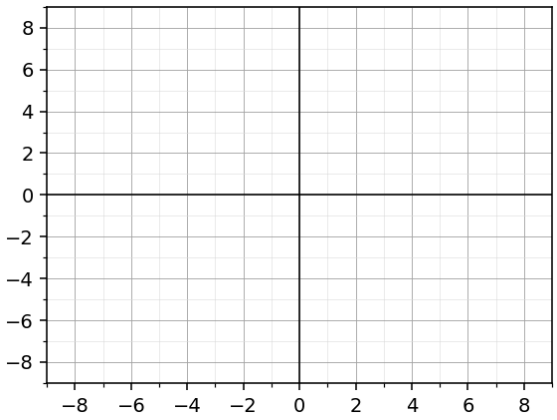
11. Write an equation that could match this graph: a hole at (−2, 2), vertical asymptote x = 1, and horizontal asymptote y = 3.

State a possible factored rational function.



12. Analyze and sketch: VA, horizontal asymptote, intercepts, hole (coordinate), domain, and range.

$$s(x) = \frac{(x-4)(x+2)}{(x+2)(x-1)}$$



13. AP-style MCQ: For k(x) below, which statement is correct? A. Hole x = 6, VA x = −4 B. Hole x = −4, VA x = 6 C. Two holes D. Two VAs

$$k(x) = \frac{(x - 6)(x + 1)}{(x + 4)(x - 6)}$$

14. Select the rational function with a hole at x = −3 and a vertical asymptote at x = 2.

A.

$$\frac{(x + 3)}{(x - 2)}$$

B.

$$\frac{(x + 3)(x - 2)}{(x + 3)(x - 5)}$$

C.

$$\frac{(x + 3)(x + 1)}{(x + 3)(x - 2)}$$

D.

$$\frac{(x - 2)}{(x + 3)}$$

15. Multiplicity: Which excluded x-values are holes, and which are VAs?

$$y = \frac{(x-1)^4(x+2)(x-5)^2}{(x-1)^2(x+2)^3(x-5)^2}$$

16. Free response: Use x-values approaching 3 from both sides to explain the discontinuity, then state the horizontal asymptote and any hole.

$$f(x) = \frac{2(x+1)(x-5)}{(x-3)(x-5)}$$