RATIONAL FUNCTIONS

PART A - CLASSIFY DISCONTINUITIES

STUDENT WORKSHEET

18 practice problems

Name: _____ Date: _____ Algebra II / Precalculus

Before you cancel

Write down every zero of the original denominator. A canceled zero may be a hole; a factor left below gives a vertical asymptote.

Part A: Give the domain, every hole (as a point), and every vertical asymptote. Show the simplified expression you used.

1. f(x) = (x + 3)/(x - 2)

2. f(x) = (x - 1)(x + 4)/[(x - 1)(x + 2)]

3. f(x) = (x + 2)^2/[(x + 2)(x - 3)]

4. f(x) = (x - 4)/(x - 4)^2

5. f(x) = (x^2 - 9)/(x^2 + x - 6)

6. f(x) = (x^2 - 4)/(x^2 - 4)

Intercepts and end behavior

For each function, find the original domain, holes, vertical asymptotes, horizontal asymptote, x-intercepts and y-intercept. Write 'none' when appropriate.

7. f(x) = (2x - 6)/(x + 1)

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

8. f(x) = 4/(x - 2)

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

9. f(x) = (x - 3)/(x^2 - 1)

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

10. f(x) = (x^2 - 4)/(x^2 + 1)

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

11. f(x) = (x + 1)(x - 2)/[(x + 1)(x + 3)]

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

12. f(x) = (x - 2)^2/[(x - 2)(x + 1)]

D: _____ Hole: _____ VA: _____ HA: _____ x-int: _____ y-int: _____

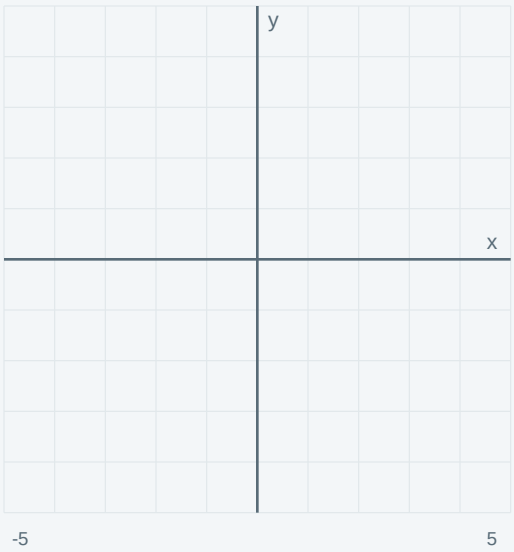
Sketch and justify

Use each grid from -5 to 5 on both axes. On the line, list domain restrictions and end behavior before drawing.

13. f(x) = x/(x - 2)

Label both intercepts, each asymptote, and one point on each branch.

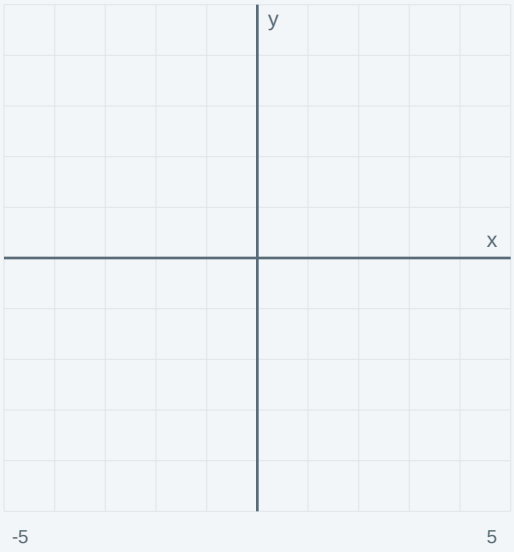
Domain / asymptotes:



14. f(x) = (x + 2)/(x^2 - 1)

Label intercepts and asymptotes; state the one-sided behavior at x = -1 and x = 1.

Domain / asymptotes:



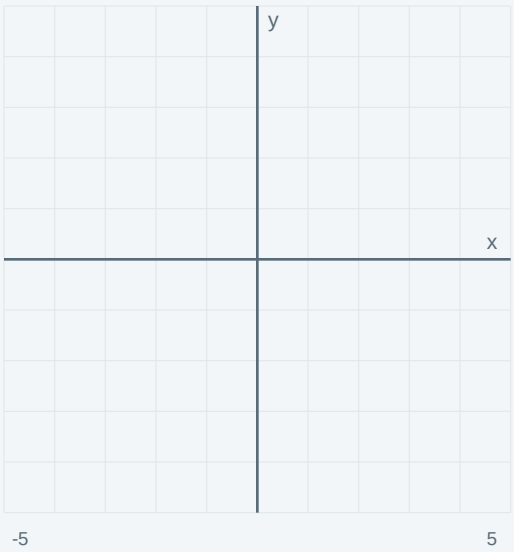
Sketch and justify

Use each grid from -5 to 5 on both axes. On the line, list domain restrictions and end behavior before drawing.

15. f(x) = (x^2 - 1)/(x - 3)

Use division to find the slant asymptote. Label it and both x-intercepts.

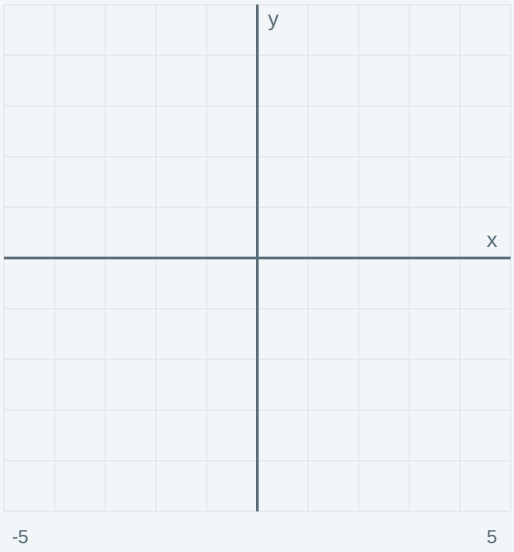
Domain / asymptotes:



16. f(x) = (x^2 + x - 2)/(x^2 + 1)

Find where the graph crosses its horizontal asymptote, then sketch.

Domain / asymptotes:



Explain the differences

Explain your decisions in sentences. A canceled factor never returns a forbidden input to the domain.

17. At x = 2, compare A, B and C:

A = (x - 2)/(x - 2); B = (x - 2)^2/(x - 2); C = (x - 2)/(x - 2)^2. For each: hole, vertical asymptote, or neither? Give a hole coordinate when needed.

18. Design a rational function.

Make a function with vertical asymptote x = 1, a hole at x = -2, x-intercept (3, 0), and horizontal asymptote y = 2. Then calculate the hole's y-coordinate.

Self-check before turning it in

Did you keep original exclusions? Did you test each numerator zero against the domain? Did you use division when the numerator's degree is greater?