

Kuy

## Graphing Rational Functions Review

Graph the function with a solid line and the asymptotes with a dashed line.

$$1. f(x) = \frac{x+1}{x+4}$$

Test 0:  $\frac{1}{4}$   
 $(0, \frac{1}{4})$

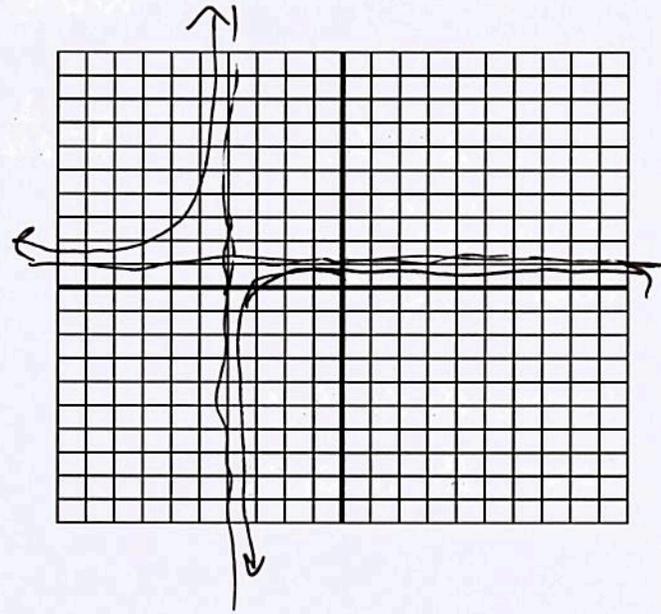
VA:  $x = -4$

HA:  $y = 1$

Hole: None

Domain:  $\mathbb{R} \ x \neq -4$

Range:  $\mathbb{R} \ y \neq 1$



$$2. f(x) = -\frac{1}{x-2} + 7$$

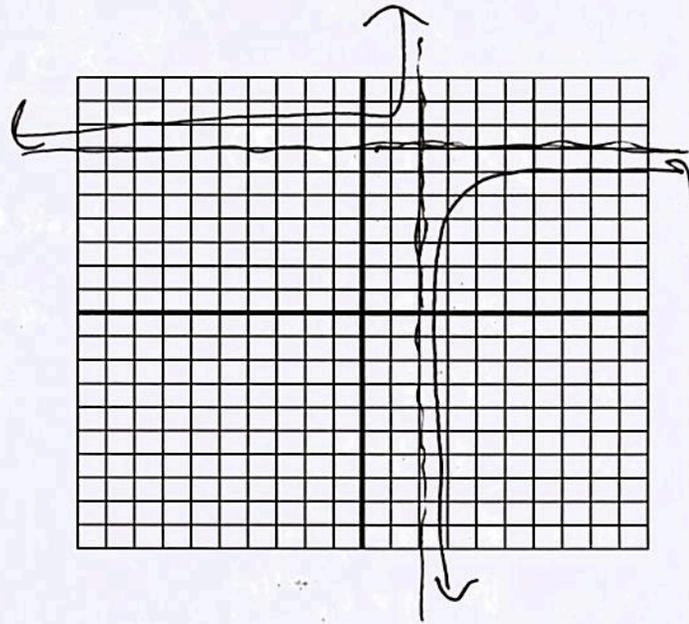
VA:  $x = 2$

HA:  $y = 7$

Hole: None

Domain:  $\mathbb{R} \ x \neq 2$

Range:  $\mathbb{R} \ y \neq 7$



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

$$\frac{1}{x+2}$$

hole @  $x-2=0$   
 $x=2$

$$y = \frac{1}{2+2} = \frac{1}{4}$$

2, 1/4

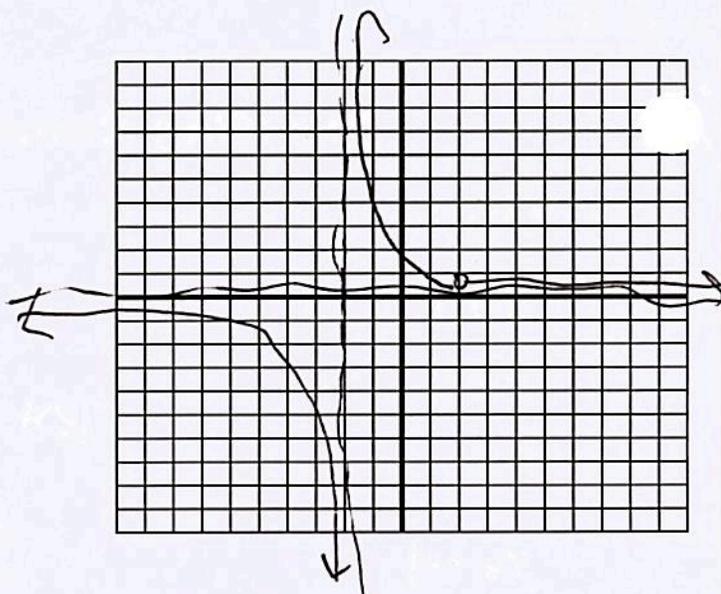
VA  $x = -2$

HA  $y = 0$

Holes 2, 1/4

Domain  $\mathbb{R} x \neq -2, 2$

Range  $\mathbb{R} y \neq 0, 1/4$



$$4. f(x) = \frac{x+4}{x^2+x-12}$$

$$(\cancel{x+4})(x-3)$$

$$y = \frac{1}{x-3}$$

hole @  $x = -4$

$$\frac{1}{-4-3} = -\frac{1}{7}$$

-4, -1/7

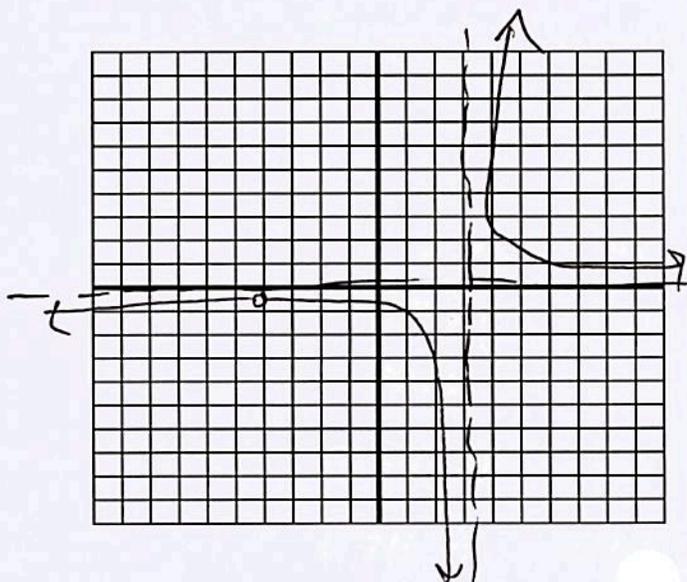
VA  $x = 3$

HA  $y = 0$

Hole  $(-4, -1/7)$

Domain  $\mathbb{R} x \neq 3, -4$

Range  $\mathbb{R} y \neq 0, -1/7$



$$5. f(x) = \frac{x^2 - x - 6}{x^2 - 9}$$

$$y = \frac{x+2}{x+3}$$

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

$$x = 3$$

$$y = \frac{3+2}{3+3} = \frac{5}{6}$$

$$(3, 5/6)$$

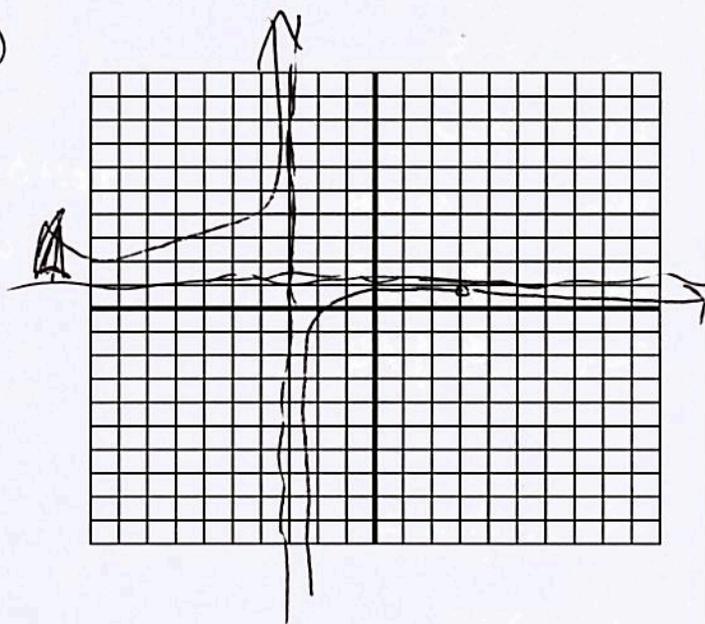
VA  $x = 3$

HA  $y = 1$

Hole  $(3, 5/6)$

Domain  $\mathbb{R} \ x \neq -3, 3$

Range  $\mathbb{R} \ y \neq 1, 5/6$



*hoho*

$$6. f(x) = \frac{x^2 + 4}{x^2 - 5x + 4} = \frac{x+4}{(x-4)(x-1)}$$

VA  $x = 4 \ x = 1$

HA  $y = 0$

Hole NONE

Domain  $\mathbb{R} \ x \neq 4, 1$

Range  $\mathbb{R} \ y \neq 0$

Test 0:  $\frac{4}{(-4)(-1)} = 1$

$$(0, 1)$$

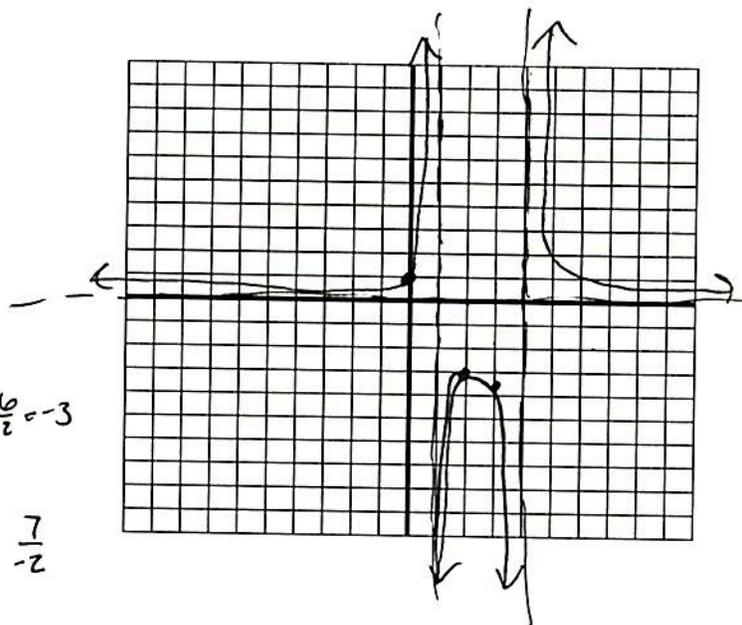
Test 2:  $\frac{2+4}{2^2 - 5(2) + 4}$

$$\frac{6}{4 - 10 + 4} = \frac{6}{-2} = -3$$

$$(2, -3)$$

Test 3:  $\frac{3+4}{9 - 15 + 4} = \frac{7}{-2}$

$$(3, -7/2)$$



$$7. y = \frac{-1}{x-3}$$

$$\text{VA } x=3$$

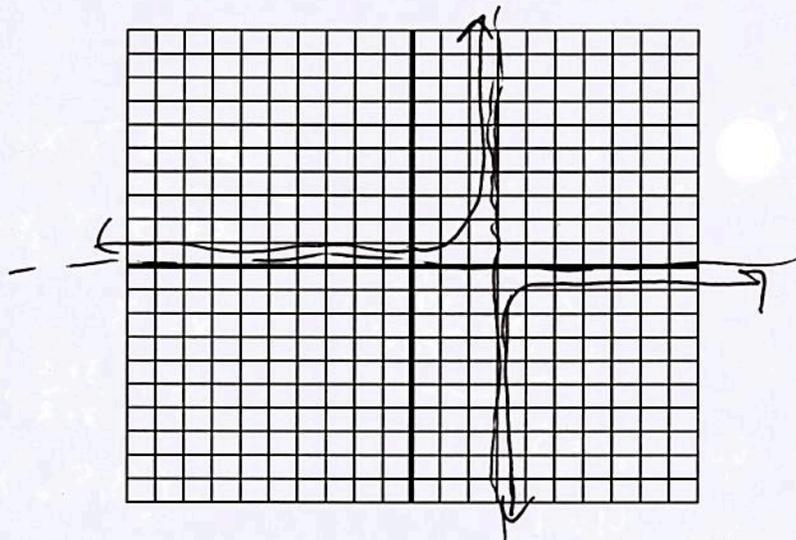
$$\text{HA } y=0$$

Hole NONE

$$\text{Domain } \mathbb{R} \ x \neq 3$$

$$\text{Range } \mathbb{R} \ y \neq 0$$

$$\text{Test 0: } \frac{-1}{-3} \\ 0, 1/3$$



$$8. y = \frac{1}{x} - 3$$

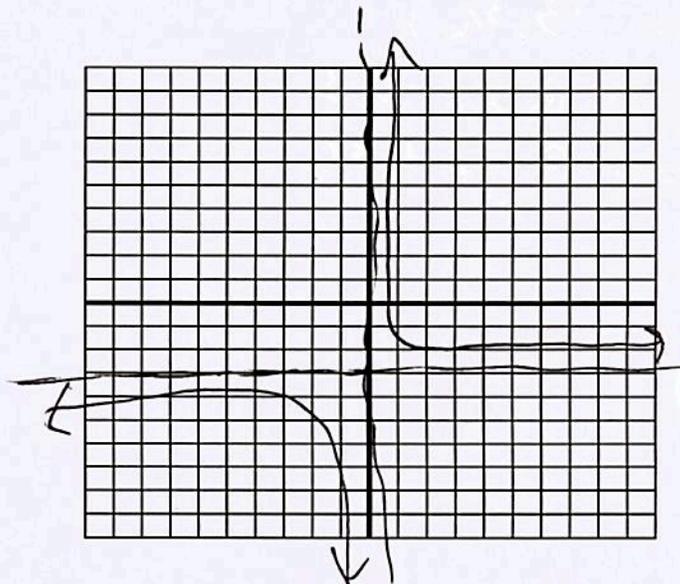
$$\text{VA } x=0$$

$$\text{HA } y=-3$$

Hole NONE

$$\text{Domain } \mathbb{R} \ x \neq 0$$

$$\text{Range } \mathbb{R} \ y \neq -3$$



9. What is the V.A.?

$$f(x) = \frac{x+5}{x+3} \quad \boxed{x = -3}$$

10. What is the H.A.?

$$f(x) = \frac{5x+6}{x+3} \quad \boxed{y = 5}$$

19. What is the V.A.?

$$f(x) = -\frac{3}{4x^2 - 12x} = -\frac{3}{4x(x-3)}$$

$$x=0, x=3$$

20. What is the V.A.?

$$f(x) = \frac{x^2 - 16}{2x^2 + 5x - 12} = \frac{(x+4)(x-4)}{(2x-3)(x+4)}$$

$$x = 3/2$$

$$\begin{array}{r|l} 2x-3 & \\ \hline x & 2x^2 - 3x \\ + & 4 \quad 8x - 12 \\ \hline & -24 \end{array}$$

21. What is the H.A.?

$$f(x) = \frac{x^2 - 16}{2x^2 + 5x - 12} = \frac{(x+4)(x-4)}{(2x-3)(x+4)}$$

$$y = 4/2$$

22. Identify the hole:

$$f(x) = \frac{x^2 - 16}{2x^2 + 5x - 12} = \frac{(x+4)(x-4)}{(x+4)(2x-3)} \quad \frac{-4-4}{2(-4)-3} = \frac{-8}{-11}$$

$$(-4, 8/11)$$

$$\begin{array}{r|l} 2x-3 & \\ \hline x & 2x^2 - 3x \\ + & 4 \quad 8x - 12 \\ \hline & -24 \end{array}$$

23. What is the H.A.?

$$f(x) = \frac{4x^2 + 13x - 12}{2x^2 + 13x + 20}$$

$$y = 2$$

24. What is the V.A.?

$$f(x) = \frac{4x^2 + 13x - 12}{2x^2 + 13x + 20} = \frac{(x+4)(4x-3)}{(2x+5)(x+4)}$$

$$x = -5/2$$

$$\begin{array}{r|l} 2x+5 & \\ \hline x & 2x^2 + 5x \\ + & 4 \quad 8x + 20 \\ \hline & 40 \end{array}$$

$$\begin{array}{r|l} x+4 & \\ \hline 4x & 4x^2 + 16x \\ - & 3 \quad -3x - 12 \\ \hline & 40 \end{array}$$

25. Identify the hole:

$$f(x) = \frac{4x^2 + 13x - 12}{2x^2 + 13x + 20} = \frac{(x+4)(4x-3)}{(2x+5)(x+4)}$$

$$\frac{4(-4)-3}{2(-4)+5} = \frac{-19}{-3} = \frac{19}{3}$$

$$(-4, \frac{19}{3})$$

26. What is the domain restriction?

$$f(x) = \frac{x^2 - 10x - 24}{x^2 - 4} = \frac{(x-12)(x+2)}{(x+2)(x-2)}$$

$$x = -2$$

$$\mathbb{R}; x \neq 2, -2$$

27. What is the range restriction?

$$f(x) = \frac{x^2 - 10x - 24}{x^2 - 4} = \frac{(x-12)(x+2)}{(x+2)(x-2)}$$

$$\frac{-2-12}{(-2)-2} = \frac{-14}{-4} = \frac{7}{2}$$

$$\mathbb{R}; y \neq 2, 7/2$$

28. What is the H.A.?

$$f(x) = \frac{x^2 - 10x - 24}{x - 4}$$

$$\text{None}$$

11. What is the domain restriction?

$$f(x) = \frac{x+6}{x-2} \quad \boxed{x \neq 2}$$

15. What is the V.A.?

$$f(x) = \frac{x(x+3)}{(x+3)(x-3)} \quad \boxed{x=3}$$

12. What is the Range:

$$f(x) = \frac{x-2}{(x-2)(x+3)}$$
$$y = \frac{1}{x+3} \quad \boxed{\mathbb{R}; y \neq 0, \frac{1}{5}}$$

hole  $2, \frac{1}{5}$

16. What is the H.A.?

$$f(x) = \frac{x+6}{x-2} \quad \boxed{y=1}$$

13. What is the Domain:

$$f(x) = \frac{x(x+3)}{(x+3)(x-3)} \quad x = -3$$
$$y = \frac{x}{x-3} \quad \frac{-3}{-3-3} = \frac{3}{6} = \frac{1}{2}$$

$$y=0$$
$$x=3$$

hole  $(-3, \frac{1}{2})$

$$\boxed{\mathbb{R} \ x \neq -3, 3}$$

17. Identify the hole:

$$f(x) = \frac{2x+6}{x+3} \quad \frac{2(x+3)}{x+3}$$
$$y=2 \quad \boxed{\text{hole @ } (-3, 2)}$$

14. Identify the hole:

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

$$y = -2 - 1 = -3$$

$$\boxed{(-2, -3)}$$

18. Identify the hole:

$$f(x) = \frac{x(x+3)}{(x+3)(x-3)} \quad x = -3$$
$$y = \frac{x}{x-3} \quad \frac{-3}{-3-3} = \frac{3}{6} = \frac{1}{2}$$

$$\boxed{(-3, \frac{1}{2})}$$