

Algebra II
Graphing Rational Functions Review

Name _____
Date _____

1. Does $f(x) = \frac{x^3 - 2x^2 + 3}{x^2 - 1}$ have a slant asymptote? Bigger Degree on Top YES

2. Write a function with NO VERTICAL ASYMPTOTE
No Real $x=s$ on bottom $y = \frac{1}{x^2 + 3}$

3. What is the coordinates of the hole for the function $f(x) = \frac{x^2 - 4}{x^2 + 2x - 8}$
 $f(x) = \frac{(x+2)(x-2)}{(x+4)(x-2)} = \frac{x+2}{x+4}$ hole $(2, \frac{2}{3})$ $(2, \frac{2}{3})$
 $\frac{2+2}{2+4} = \frac{4}{6} = \frac{2}{3}$

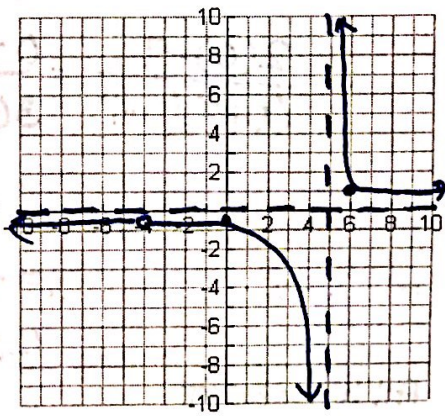
4. What are the x-int, y-int, vertical asymptote and horizontal asymptote for $g(x) = \frac{(x-3)(x+2)}{(x-2)(x+1)}$
 $\frac{x-3}{x+1}$ x-int: $(3, 0)$ y-int: $(0, -3)$
VA: $x = -1$ HA: $y = 1$

5. What is the slant asymptote for $g(x) = \frac{x^2 - 9x + 20}{x + 4}$? $\frac{(x-5)(x-4)}{x+4}$ $y = x - 13$

$$\begin{array}{r} -4 \overline{) 1 \ -9 \ 20} \\ \underline{1 \ -13 \ 72} \end{array}$$

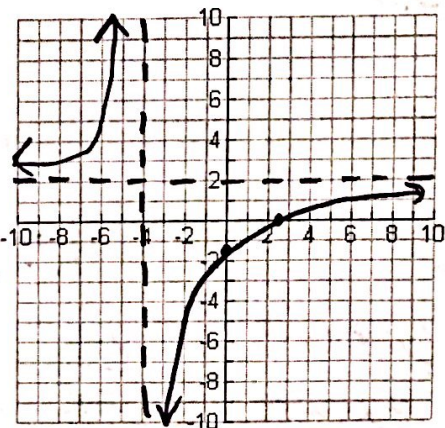
6. Use problem #5 to find its x-intercepts and y-intercepts
x-int: $(5, 0), (4, 0)$ y-int: $(0, 5)$

7. $f(x) = \frac{x + 4}{x^2 - x - 20} = \frac{x+4}{(x-5)(x+4)} = \frac{1}{x-5}$
x-int: None y-int: $(0, -\frac{1}{5})$
Vertical Asymptote: $x = 5$
Horizontal Asymptote: $y = 0$
Slant Asymptote: None
Holes: $(-4, -\frac{1}{4})$
Domain: All \mathbb{R} 's except $x \neq 5, -4$
Range: All \mathbb{R} 's except $y \neq 0, -\frac{1}{4}$
Test: $\frac{1}{+6-5} = \frac{1}{1} = 1$
 $(6, 1)$
 $\frac{1}{-4-5} = -\frac{1}{9}$



8. $f(x) = \frac{2x-5}{x+4}$
x-int: $(\frac{5}{2}, 0)$ y-int: $(0, -\frac{5}{4})$
Vertical Asymptote: $x = -4$
Horizontal Asymptote: $y = 2$
Slant Asymptote: None
Holes: None
Domain: All \mathbb{R} 's except $x \neq -4$
Range: All \mathbb{R} 's except $y \neq 2$

Test:
$$\begin{array}{r} 2(-5) - 5 \\ -10 - 5 \\ -15 \\ -1 \\ -15 \\ -1 \end{array} = 15$$



9. Write a rational function that has a Vertical Asymptote at $x = -3$ and Horizontal Asymptote at $y = 4$.

$$y = \frac{4x}{x+3}$$

← ^{degree} Need to add an x on top so degrees are the same.

10. Write a rational function that has Vertical Asymptotes at $x = 1$ and $x = 2$ and a Horizontal Asymptote at $y = 2$.

$$y = \frac{2x^2}{(x-1)(x-2)}$$

← ^{degrees} Have to add x^2 on top so the degree is same.

11. Find all the Asymptotes of $g(x) = \frac{x^2 + 4x - 5}{x + 1}$

$$g(x) = \frac{(x+5)(x-1)}{x+1}$$

VA: $x = -1$

HA: None

Slant: $y = x + 3$

$$\begin{array}{r} -1 \overline{) 1 \ 4 \ -5} \\ \underline{1 \ 3 \ -8} \end{array}$$

12. Did #11 have any holes? If so, where is the hole? No

13. Find all the Asymptotes of $h(x) = \frac{2x^2 + 4x}{x^2 + 5x + 6}$

$$h(x) = \frac{2x(x+2)}{(x+3)(x+2)} = \frac{2x}{x+3}$$

VA: $x = -3$

HA: $y = 2$

Slant: None

14. Did #13 have any holes? If so, where is the hole? Yes

$$\boxed{(-2, -4)}$$

$$\frac{2(-2)}{-2+3} = \frac{-4}{1} = -4$$

15. What is the x-intercept and y-intercept for $h(x) = \frac{2x - 9}{(x + 3)(x - 1)}$

$$\frac{2(0) - 9}{(0 + 3)(0 - 1)} = \frac{0 - 9}{3(-1)} = \frac{-9}{-3} = 3$$

x-int: $(\frac{9}{2}, 0)$
y-int: $(0, 3)$

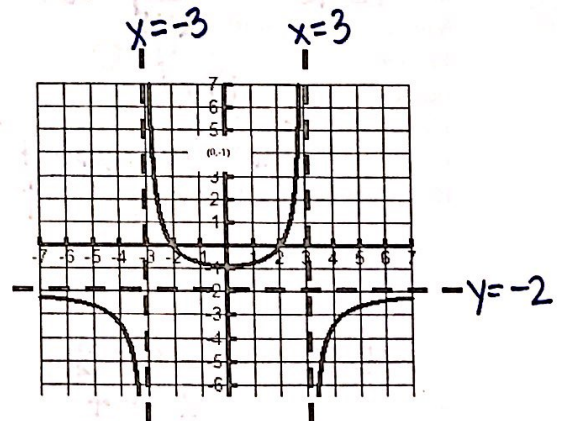
16. Find horizontal and vertical asymptotes of the rational function,

Domain, range,
HA: $y = 2$

VA: $x = -3, 3$

Domain: All \mathbb{R} 's except $x \neq -3, 3$

Range: $(-\infty, -2) \cup [-1, \infty)$



17. Given $g(x) = \frac{x^2 - 9}{3x^2 + 9x}$, A. explain what is occurring at $x = -3$? B. What are the asymptotes?

a. hole

b. VA: $x = 0$; HA: $y = \frac{1}{3}$; Slant: None

$$g(x) = \frac{(x+3)(x-3)}{3x(x+3)} = \frac{x-3}{3x}$$

17. Jason can clean a large tank at an aquarium in about 6 hours. When Jason and Lacy work together, they can clean the tank in about 3.5 hours. About how long would it take Lacy to clean the tank if she works by herself?

$$J + L = T$$

$$\overset{3.5}{21x} \left(\frac{1}{6} \right) + \overset{24}{x} \left(\frac{1}{x} \right) = \left(\frac{1}{3.5} \right) \overset{6}{21x}$$

$$3.5x + 21 = 6x$$

$$\underline{-3.5x} \quad \underline{-3.5x}$$

$$21 = 2.5x$$

$$\frac{21}{2.5} = \frac{2.5x}{2.5}$$

$$8.4 = x$$

Lacy 8.4 hrs

18. Julien can mulch a garden in 20 minutes. Remy can mulch the same garden in 24 mins. If Julien and Remy mulched the same garden together, how long would it take them?

$$J + R = T$$

$$\overset{24}{480x} \left(\frac{1}{20} \right) + \overset{30}{480x} \left(\frac{1}{24} \right) = \left(\frac{1}{x} \right) \overset{480}{480x}$$

$$24x + 20x = 480$$

$$44x = 480$$

$$x = 10.9$$

10.9 min

19. Sarah takes twice as long as Susan to make the display case at school. Together it takes 6 hours to do the display case. How long does it take Sarah to do it by herself.

$$\text{Sarah} + \text{Susan} = T$$

$$\overset{3}{6x} \left(\frac{1}{2x} \right) + \overset{6}{6x} \left(\frac{1}{x} \right) = \left(\frac{1}{6} \right) \overset{6}{6x}$$

$$3 + 6 = x$$

$$9 = x$$

$$\text{Sarah} = 2x$$

$$2(9)$$

18 hours

20. The ratio of 3 less than a number to 25 more than that number is 1 to 3. What is the number?

$$\frac{x-3}{x+25} = \frac{1}{3}$$

$$3x-9 = x+25$$

$$\underline{-x+9} \quad \underline{-x+9}$$

$$2x = 34$$

x = 17

21. A car travels 300 km in the same time that a freight train travels 200 km. The speed of the car is 20km/h more than the speed of the train. Find the speed of the car and the speed of the train.

	D	R	T
Car	300	x+20	300/x+20
Train	200	x	200/x

Train 40 km/hr
 Car 60 km/hr

$$\frac{300}{x+20} = \frac{200}{x}$$

$$100x = 4000$$

$$x = 40$$

$$300x = 200x + 4000$$