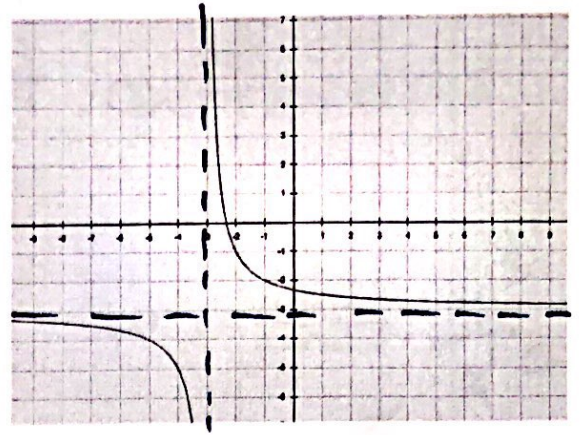
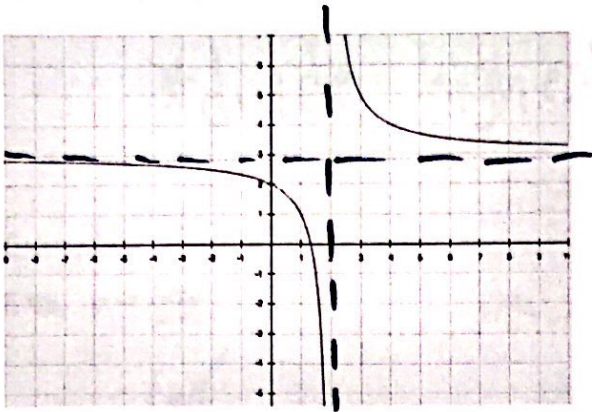


GUIDED NOTES: Asymptotes of Rational Functions

What are asymptotes?



DOMAIN: The domain of a function is the set of all possible X-values
Asymptotes are values not included in the domain!

Vertical Asymptotes:

To find vertical asymptotes: factor, simplify. Whatever is left in your denominator = VA. set = 0 & solve

EX1. $y = \frac{x-3}{(x+2)(x-2)}$

$$x+2=0$$

$$\boxed{x=-2}$$

$$x-2=0$$

$$\boxed{x=2}$$

EX2. $y = \frac{x-1}{x^2+5x+4}$

$$\begin{array}{r} x^2 + 5x + 4 \\ \underline{x + 4} \\ x^2 + 4x + 4 \\ \underline{x + 4} \\ x + 4 \\ \underline{x + 4} \\ 0 \end{array}$$

$$x(x+4) + 1(x+4) = (x+4)(x+1)$$

$$x+4=0$$

$$\boxed{x=-4}$$

$$x+1=0$$

$$\boxed{x=-1}$$

Holes:

What is the Vertical Asymptote of $y = \frac{x(x-4)}{x-4}$? Graph it, what do you notice?

A **HOLE** in the graph is when $(x - a)$ is a factor in both the numerator and the denominator (It cancels out!!!)

EX3. $y = \frac{x^2-1}{x^2-2x-3}$

$$x^2 - 1$$

$$\sqrt{x^2} = x$$

$$\sqrt{1} = 1$$

$$(x+1)(x-1)$$

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

$$x^2 - 2x - 3$$

$$x^2 - 3x + x - 3$$

$$\underline{x^2 - 3x} \quad \underline{x - 3}$$

$$x - 3$$

$$\underline{x - 3}$$

$$0$$

$$x(x-3) + 1(x-3) = (x-3)(x+1)$$

$$x+1=0$$

$$\boxed{x=-1}$$

EX4. $y = \frac{12x+24}{x^2+2x}$

$$y = \frac{12(x+2)}{x(x+2)}$$

$$x+2=0$$

$$\boxed{x=-2}$$

Horizontal Asymptotes:

To find a horizontal asymptotes, we focus on the highest exponent of the numerator and the denominator!

*divide highest exponent coefficients

Examples:

EX5. $y = \frac{6x-5}{3x+9}$

$$y = \frac{6x}{3x}$$

$$y = 2$$

EX6. $y = \frac{4x^6+3x^4-4x^2}{3x}$

$$y = \frac{4x^6}{0x^6}$$

$$\text{DNE}$$

Error
Ahh!

EX7. $y = \frac{(x-3)(x+4)^2}{(x-5)^3(x+2)^2}$

$$\frac{x^3}{x^5}$$

$$y = \frac{0x}{1x^2}$$

$$y = 0$$

EVERYTHING ALL TOGETHER:

Find the holes, vertical asymptotes, domain, and horizontal asymptote for each rational function.

EX8. $y = \frac{5x^2+20x}{x^2+11x+28}$

$$y = \frac{5x(x+4)}{(x+4)(x+7)}$$

hole: $x+4=0$
 $x=-4$

VA: $x+7=0$
 $x=-7$

Domain: $x \neq -4, -7$

HA: $y = \frac{5x^2}{1x^2}$
 $y=5$

EX9. $y = \frac{2x^2+10x+12}{x^3+3x^2+2x}$

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

hole: $x+2=0$
 $x=-2$

VA: $x=0$ $x+1=0$
 $x=-1$

Domain: $x \neq -2, 0, -1$

HA: $y = \frac{0x^3}{1x^3}$
 $y=0$