

Warm-Up

Simplify the following rational expressions:

1. $\frac{x^2 - 11x + 18}{x^2 + 2x - 8}$

$= \frac{(x-9)(x-2)}{(x+4)(x-2)}$
 $= \frac{(x-9)}{(x+4)}$

2. $\frac{b^2 + 3b - 28}{b^2 - 49}$

$= \frac{(b+7)(b-4)}{(b+7)(b-7)}$
 $= \frac{(b-4)}{(b-7)}$

3. $\frac{x^2 + 4x}{x^2 + 10x + 24}$

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

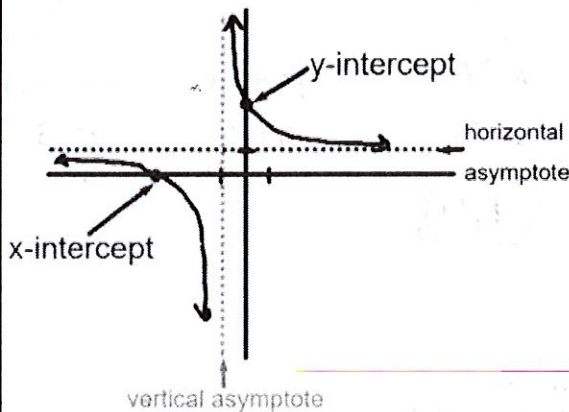
Characteristics of a Rational Graph

Rational Functions and Asymptotes

Vertical Asymptote

A vertical line that the graph approaches but does not cross.

Vertical Asymptote



X-intercept

A point where the graph crosses the x-axis.

X-Intercepts

Holes

Hole

A hole on the graph for which the function is undefined that is not the vertical asymptote.

Vertical Asymptote

To find the vertical asymptote:

1. FACTOR both the numerator and denominator.
2. Set the DENOMINATOR equal to zero and solve.
3. When graphing, draw a vertical line through the x-axis at that point

Example: $f(x) = \frac{3x-12}{x^2-3x-28} = \frac{3(x-4)}{(x+4)(x-7)}$

$x+4=0$ $x-7=0$
 $x=-4$ $x=7$

X-Intercepts

To find the x-intercept(s):

1. FACTOR both the numerator and denominator.
2. Set the NUMERATOR equal to zero and solve.
3. Write your x-intercept as a coordinate.
4. When graphing, plot the x-intercept(s) on the x - axis.

Example: $f(x) = \frac{x^2-x-12}{x^2+10x-24} = \frac{(x-4)(x+3)}{(x+12)(x-2)}$

$x-4=0$ $x+3=0$
 $x=4$ $x=-3$
 $(4,0)$ $(-3,0)$

Holes

To find the holes:

1. FACTOR both the numerator and denominator.
2. Cancel any common factors.
3. Set any cancelled factors equal to zero and solve (these are the x-values of your hole(s)).
4. To find the y-value of the coordinate, plug the x-value into rational expression AFTER cancelling common factors.

Example: $f(x) = \frac{4x-8}{x^2+10x-24} = \frac{4(x-2)}{(x+12)(x-2)}$ Hole: $(2, \frac{2}{7})$

$x-2=0$

$x=2$

$\frac{4}{x+12} \rightarrow \frac{4}{2+12} = \frac{4}{14} = \frac{2}{7} \approx 0.28$

You Try

For each example, find the Holes, Vertical Asymptote(s) and X-Intercept(s).

1. $f(x) = \frac{x^2-5x-14}{x^2+7x+10} = \frac{(x-7)(x+2)}{(x+5)(x+2)}$

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

Hole(s)	VA	X-Int
$x+2=0$ $x=-2$ $\frac{-2-7}{-2+5} = \frac{-9}{3}$ $(-2, -3)$	$x+5=0$ $x=-5$	$x-7=0$ $x=7$ $(7, 0)$

Hole(s)	VA	X-Int
none n/a	$x-5=0$ $x=5$	$2x^2=0$ $x^2=0$ $x=0$ $(0, 0)$

3. $f(x) = \frac{x-1}{x^2+3x-10} = \frac{x-1}{(x+5)(x-2)}$

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

Hole(s)	VA	X-Int
none n/a	$x+5=0$ $x=-5$ $x-2=0$ $x=2$	$x-1=0$ $x=1$ $(1, 0)$

Hole(s)	VA	X-Int

Summary

Summarize the lesson in your own words