Name: ____ Period: __________ Date: _______________

Rational Functions Guided Notes

Rational Function

A rational function is a fraction of polynomials $p(x)$ and $q(x)$.

Mathematically:

$$\boldsymbol{f = \frac{p(x)}{q(x)}}$$

Where $p(x)$ is the numerator and $q(x)$ is the denominator.

Example:

- $\boldsymbol{f = \frac{1}{x-1}}$
- $\boldsymbol{f = \frac{y(y-2)}{(y-3)}}$

Domain of Rational Function

Domain of a rational function is the set of all real numbers except the roots of the denominator polynomial $q(x)$.

Range of Rational Function

Range of a rational function is the set of all real numbers except those values of input(domain) that give the output as ∞ i.e. the output of the numbers excluded from domain.

Vertical Asymptotes

Vertical asymptotes are the vertical lines passing through the roots of denominator polynomial $q(x)$ and touching the graph of the rational function. The graph of rational function rises up or slides down the sides of the vertical asymptotes.

x-intercepts

These are the points where the graph of a rational function meets the x-axis and are the roots of the numerator polynomial $f(x)$ in the rational function.

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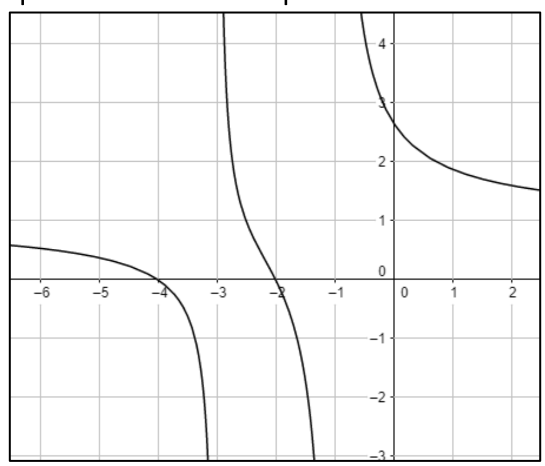
Problem 1: Find the domain, vertical asymptotes and x-intercepts of the rational function $\frac{4(x-2)(x^2-1)}{3(x-3)(x+4)}$.

Interpreting Graph of Rational Function

Given the graph of a rational function, we can identify its vertical asymptotes and x-intercepts.



From the graph we can see that the function has two vertical asymptotes at $x = -3$ and $x = -1$ (since f is ∞).

Also, the graph touches x-axis at $x = -4$and $x = -2$, which are the x-intercepts.

We can also say that numerator $p(x)$ has factors $(x + 4)(x + 2)$ and denominator $q(x)$ has factors $(x + 3)(x + 2)$.

Problem 2: Solve the equation $y + \frac{6}{y} = 5$.