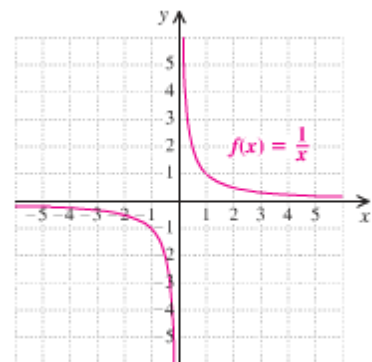


Definition: A rational expression is an expression consisting of a _____
_____ by a _____.

Example 1:

Rational expressions can be used to _____ called _____
_____.

Example 2: $f(x) = \frac{1}{x}$



Example 3: Rik usually takes 3 hours more than Pearl does to process a day's orders at Liberty Place Photo. If Pearl takes t hours to process a day's orders, the function given by $H(t) = \frac{t^2 + 3t}{2t + 3}$ can be used to determine how long it would take if they worked together.

How long will it take them, working together to complete a day's orders if Pearl can process the orders alone in 5 hours?

Method: Products of Rational Expressions

To multiply two rational expressions, multiply numerators and multiply denominators:

$$\frac{A}{B} \cdot \frac{C}{D} = \frac{AC}{BD}, \text{ where } B \neq 0, D \neq 0$$

Example 4: Multiply $\frac{x+5}{x-4} \cdot \frac{y-1}{x^3}$

Review: How do we reduce $\frac{8}{14}$?

Similarly, reduce $\frac{(x-3)(x-2)}{(x+5)(x-2)}$

What is different between $\frac{(x-3)(x-2)}{(x+5)(x-2)}$ and $\frac{(x-3)}{(x+5)}$?

Example 5: Write the function in simplified form. Be careful with the domains

a.) $f(t) = \frac{5t^2 + 20t}{t^2 + 4t}$

b.) $g(m) = \frac{m^2 - 9}{3m + 3} \cdot \frac{m + 3}{m - 3}$

Example 6: Simplify

a.) $\frac{x^2 - 16}{x^2} \cdot \frac{x^2 - 4x}{x^2 - x - 12}$

b.) $\frac{a^2 - 1}{2 - 5a} \cdot \frac{15a - 6}{a^2 + 5a - 6}$

Important: We canNOT cancel over _____

Example 7: Simplify

a.) $\frac{x+1}{x}$

b.) $\frac{6t-1}{2}$

c.) $\frac{2x}{x+1}$

$$d.) \frac{x^3 + y^3}{x^2 + 2xy - 3y^2} \cdot \frac{x^2 - y^2}{3x^2 + 6xy + 3y^2}$$

Method: Quotients of Rational Expressions

To divide two rational expressions, invert the second expression and multiply:

$$\frac{A}{B} \div \frac{C}{D} = \frac{A}{B} \cdot \frac{D}{C} = \frac{AD}{BC}, \text{ where } B \neq 0, D \neq 0$$

Example 8: Simplify

$$a.) \frac{3y+15}{y^7} \div \frac{y+5}{y^2}$$

$$b.) \frac{x^2 - y^2}{4x + 4y} \div \frac{3y - 3x}{12x^2}$$

Example 9: Simplify $g(x) = \frac{x^2 - 9}{x^2} \div \frac{x^5 + 3x^4}{x + 2}$ and list all domain restrictions

Let's explore an example to learn a bit about vertical asymptotes ... consider $H(t) = \frac{t^2 + 5t}{2t + 5}$. Use your

calculator to generate a graph. Looking at the graph, what happens at $t = -\frac{5}{2}$? This is called a

_____.

Example 10: Consider $f(x) = \frac{(x-1)(x+3)}{(2x+1)(x+3)}$ and $g(x) = \frac{x-1}{2x+1}$. Find and compare their vertical asymptotes and domains.

Example 11: Find the vertical asymptote(s) of $g(x) = \frac{x^2 - 4}{2x^2 - 5x + 2}$.