

Simplifying, Multiplying & Dividing Rational Expressions (unit 4 Day 2)

$$p(x) = \frac{f(x)}{g(x)}$$

* Domain of a rational is all real numbers except any x-values that makes the denominator 0.

(ex) $y = \frac{x-3}{x-2}$ $x \neq 2$ Domain: $(-\infty, 2) \cup (2, \infty)$

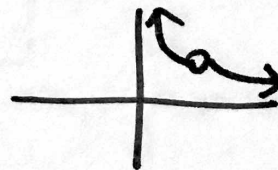
(ex) $y = \frac{2x}{x^2+3}$ ~~Domain~~ Domain: $(-\infty, \infty)$

(ex) $y = \frac{x}{x^2-4}$ $x \neq 2, -2$ Domain: $(-\infty, -2) \cup (-2, 2) \cup (2, \infty)$

$= \frac{x}{(x-2)(x+2)}$ $x-2=0$ $x+2=0$
 $x \neq 2$ $x \neq -2$ "excluded values"
 "restrictions"

Simplifying

(ex) $\frac{n+6}{3n+18} = \frac{\cancel{n+6}}{3(\cancel{n+6})} = \frac{1}{3}$
 ← hole $n \neq -6$
 ← $a \neq b$



(ex) $\frac{a^2-b^2}{a-b} = \frac{\cancel{(a-b)}(a+b)}{\cancel{a-b}} = \boxed{a+b}$

$$\textcircled{\text{ex}} \frac{t^2 + 5t + 6}{t^2 + 6t + 8} = \frac{(t+3)(t+2)}{(t+4)\cancel{(t+2)}} = \boxed{\frac{t+3}{t+4}} \quad t \neq -4$$

$t \neq -2$

$$\textcircled{\text{ex}} \frac{3s^2 - 27}{s^2 + 7s + 12} = \frac{3(s^2 - 9)}{(s+4)(s+3)} = \frac{3\cancel{(s+3)}(s-3)}{(s+4)\cancel{(s+3)}} = \boxed{\frac{3(s-3)}{s+4}} \quad s \neq -3$$

$s \neq -4$

$$\textcircled{\text{ex}} \frac{7k^4}{5k^3 - 2k^2} = \frac{7k^4}{k^2(5k-2)} = \frac{\cancel{7} \cancel{k} \cancel{k} \cancel{k} k}{\cancel{k} \cdot \cancel{k} (5k-2)} = \boxed{\frac{7k^2}{5k-2}}$$

$$5k - 2 = 0$$

$$5k = 2$$

$$k \neq \frac{2}{5}$$

$$\textcircled{\text{ex}} \frac{2a^2b}{b^2c} \cdot \frac{b}{a} = \frac{2a^2\cancel{b^2}}{a\cancel{b^2}c} = \boxed{\frac{2a}{c}}$$

$$\textcircled{\text{ex}} \frac{12m-18}{18n} \cdot \frac{9n^2}{8m-12}$$

$$= \frac{\cancel{3} \cancel{6} (2m-3)}{2 \cdot \cancel{18} n} \cdot \frac{\cancel{9} n^2}{2 \cdot \cancel{4} (2m-3)} = \boxed{\frac{3n}{4}}$$

$$\textcircled{\text{ex}} \frac{x^2-1}{2x-6} \cdot \frac{x^2-9}{3x-3} = \frac{(x+1)\cancel{(x-1)}}{2\cancel{(x-3)}} \cdot \frac{\cancel{(x-3)}(x+3)}{3\cancel{(x-1)}}$$

$x \neq 1, 3$

$$= \boxed{\frac{(x+1)(x+3)}{6}}$$

$$\textcircled{\text{ex}} \frac{2c^2-5c-3}{c+d} \cdot \frac{c^2-d^2}{2c+1}$$

$$= \frac{\cancel{(2c+1)}(c-3)}{\cancel{c+d}} \cdot \frac{\cancel{(c+d)}(c-d)}{\cancel{2c+1}}$$

$$= \boxed{(c-3)(c-d)}$$

$$2c^2 - 5c - 3$$

$$\underline{2c^2 - 6c + 1c - 3}$$

$$2c(c-3) + 1(c-3)$$

$$(2c+1)(c-3)$$

$$\begin{array}{r} -6 \\ 1 \backslash \\ -6c \quad 1c \end{array}$$

Dividing Factor, keep, change, flip

$$\textcircled{\text{ex}} \frac{x^2-49}{x^2-36} \div \frac{x+7}{x-6}$$

$$= \frac{\cancel{(x+7)}(x-7)}{(x+6)\cancel{(x-6)}} \cdot \frac{\cancel{x-6}}{\cancel{x+7}} = \boxed{\frac{x-7}{x+6}}$$

$x \neq 6, -7, -6$

$$\textcircled{\text{ex}} \frac{x^2 - x - 6}{x^2 + 2x - 15} \div \frac{x^2 - 4x - 5}{x^2 - 25}$$

$$= \frac{\cancel{(x-3)}(x+2)}{\cancel{(x+5)}\cancel{(x-3)}} \cdot \frac{\cancel{(x+5)}\cancel{(x-5)}}{\cancel{(x-5)}(x+1)} = \boxed{\frac{x+2}{x+1}} \quad x \neq -5, 3, 5, -1$$