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

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

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

Simplifying

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

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

(ex) $\dfrac{t^2+5t+6}{t^2+6t+8} = \dfrac{(t+3)(t+2)}{(t+4)(t+2)} = \boxed{\dfrac{t+3}{t+4}}$ $t \neq -4$, $t \neq -2$

(ex) $\dfrac{3s^2-27}{s^2+7s+12} = \dfrac{3(s^2-9)}{(s+4)(s+3)} = \dfrac{3(s+3)(s-3)}{(s+4)(s+3)} = \boxed{\dfrac{3(s-3)}{s+4}}$ $s \neq -3$, $s \neq -4$

(ex) $\dfrac{7k^4}{5k^3-2k^2} = \dfrac{7k^4}{k^2(5k-2)} = \dfrac{7kkkk}{k\cdot k(5k-2)} = \boxed{\dfrac{7k^2}{5k-2}}$

$5k-2=0$

$5k=2$

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

(ex) $\dfrac{2a^2b}{b^2c} \cdot \dfrac{b}{a} = \dfrac{2a^2b^2}{a^2b^2c} = \boxed{\dfrac{2a}{c}}$

(ex) $\dfrac{12m-18}{8n} \cdot \dfrac{4n^2}{8m-12}$

$= \dfrac{3}{\cancel{6}(2m-3)} \cdot \dfrac{\cancel{4}n^2}{2\cdot\cancel{8}n} \cdot \dfrac{}{2\cancel{4}(2m-3)} = \boxed{\dfrac{3n}{4}}$

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

$x \neq 1, 3$

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

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

$2c^2-5c-3$

-6 / \ $-6c$ $1c$

$2c^2-6c+1c-3$

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

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

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

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

Dividing Factor, keep, change, flip

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

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

$\boxed{x \neq 6, -7, -6}$

(ex) $\dfrac{x^2-x-6}{x^2+2x-15} \div \dfrac{x^2-4x-5}{x^2-25}$

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