

Domains/Simplifying cont.

Simplifying fractions

$$\frac{2}{4} = \frac{1}{2} \quad \text{this is bc } 2, 4 \text{ have a common factor of } 2$$

When simplifying fractional expressions we cancel common factors in the numerator and denominator. Since we are canceling common factors we must factor.

Ex: $\frac{2x}{x(x+2)}$ Domain $x \neq 0, x+2 \neq 0$
(or excluded values) $x \neq 0, -2$

~~$\frac{2x}{x(x+2)}$~~ they have a common factor of x

Simplified expression $\frac{2}{x+2}$

we cannot cancel the 2's bc the 2 in the denominator is not a factor

Ex: $\frac{x^2-9}{x^2+5x+6} = \frac{(x+3)(x-3)}{(x+3)(x+2)}$ factor

~~$x+3 \neq 0$~~ , $x+2 \neq 0$

find domain, then simplify

~~$\frac{(x+3)(x-3)}{(x+3)(x+2)}$~~ $\frac{x-3}{x+2}$

Ex: $\frac{2x^2+4x}{2x^2-2x-6} = \frac{2x(x+2)}{2(x^2-x-6)} = \frac{2x(x+2)}{2(x-3)(x+2)}$

$x-3 \neq 0, x+2 \neq 0$

$x \neq 3, -2$

~~$\frac{2x(x+2)}{2(x-3)(x+2)}$~~

$\frac{x}{x-3}$

Multiplying Rational Expressions

$$\frac{\overset{4}{\cancel{8}}}{5} \cdot \frac{2}{\underset{5}{\cancel{10}}} \quad \text{simplify, then multiply}$$

you can cross reduce before you multiply

$$= \frac{4 \cdot 2}{5 \cdot 5} = \boxed{\frac{8}{25}} \quad \text{to simplify cancel out common factors}$$

Ex: $\frac{x-3}{x+2} \cdot \frac{x(x+2)}{2x(x-4)}$ cancel out common factors, then multiply across top across bottom

$$\frac{\overset{1}{\cancel{x+2}}}{\cancel{x+2}} \cdot \frac{\overset{1}{\cancel{x}} \overset{1}{\cancel{x+2}}}{2 \overset{1}{\cancel{x}} (x-4)} = \boxed{\frac{x-3}{2(x-4)}}$$

leave the num. & den. factored

Ex: $\frac{(x+2)(x-3)}{(x-4)(x+5)} \cdot \frac{(x+5)(x-1)}{(x-1)(x+2)}$ simplify, then multiply

$$\frac{\overset{1}{\cancel{x+2}} \overset{1}{\cancel{x-3}}}{\cancel{x-4} \overset{1}{\cancel{x+5}}} \cdot \frac{\overset{1}{\cancel{x+5}} \overset{1}{\cancel{x-1}}}{\cancel{x-1} \overset{1}{\cancel{x+2}}} = \boxed{\frac{(x-3)(x+5)}{(x-4)(x+5)}}$$

Ex: $\frac{x^2+2x-3}{x^2+8x+16} \cdot \frac{3x+12}{x-1}$ factor 1st, then cancel out common factors

$$\frac{(x+3)(x-1)}{(x+4)(x+4)} \cdot \frac{3(x+4)}{(x-1)}$$

now cancel

$$\frac{\overset{1}{\cancel{x+3}} \overset{1}{\cancel{x-1}}}{\overset{1}{\cancel{x+4}} \overset{1}{\cancel{x+4}}} \cdot \frac{3 \overset{1}{\cancel{x+4}}}{\overset{1}{\cancel{x-1}}} = \boxed{\frac{3(x+3)}{x+4}}$$

Ex: $\frac{x-4}{x^2+x-20} \cdot \frac{x^2+6x+5}{x^2-1} = \frac{x-4}{(x+5)(x-4)} \cdot \frac{(x+5)(x+1)}{(x+1)(x-1)}$

$$\frac{\overset{1}{\cancel{x-4}}}{\overset{1}{\cancel{x+5}} \overset{1}{\cancel{x-4}}} \cdot \frac{\overset{1}{\cancel{x+5}} \overset{1}{\cancel{x+1}}}{\overset{1}{\cancel{x+1}} \overset{1}{\cancel{x-1}}} = \boxed{\frac{1}{x-1}}$$