

Name: _____
 PC: Simplifying Rational Expressions

Date: _____
 Ms. Loughran

Do Now:

Simplify each expression.

$$1. \frac{x^2 - 4}{x^3 - 8} = \frac{(x+2)(\cancel{x-2})}{(\cancel{x-2})(x^2+2x+4)}$$

$$= \frac{x+2}{(x^2+2x+4)} \quad \begin{array}{l} R \\ x \neq 2 \\ x^2+2x+4 \neq 0 \end{array}$$

$$2. \frac{8x^2 + 10x - 3}{2x^2 - 7x - 15} = \frac{(\cancel{2x+3})(4x-1)}{(\cancel{2x+3})(x-5)}$$

$$\frac{4x-1}{x-5} \quad x \neq 5, -\frac{3}{2}$$

$8x^2 - 2x + 12x - 3$ $2x(4x-1) + 3(4x-1)$ $(2x+3)(4x-1)$	$2x^2 - 10x + 3x - 15$ $2x(x-5) + 3(x-5)$ $(2x+3)(x-5)$
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Wrapping up from Friday...

$$11. \frac{1-x^2}{x^3-1} = \frac{\cancel{(1-x)}(1+x)}{(\cancel{x-1})(x^2+x+1)} = \frac{-(1+x)}{x^2+x+1} \quad \begin{array}{l} x \neq 1 \\ x^2+x+1 \neq 0 \end{array}$$

$$12. \frac{x(x+2)+y(x+2)}{x^2+2x+xy+2y} = \frac{(x+y)(\cancel{x+2})}{(\cancel{x+2})^2} = \frac{x+y}{x+2} \quad x \neq -2$$

$$13. \frac{x^3+27}{x^3-3x^2+9x} = \frac{(x+3)(\cancel{x^2-3x+9})}{x(\cancel{x^2-3x+9})} = \frac{x+3}{x} \quad \begin{array}{l} x \neq 0 \\ x^2-3x+9 \neq 0 \end{array}$$

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PC: Multiplying and Dividing Rational Expressions

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Perform the indicated operation(s) and simplify.

$$1. \frac{4x}{x^2-4} \cdot \frac{x+2}{16x} = \frac{\cancel{4x}}{(x+2)(x-2)} \cdot \frac{\cancel{x+2}}{\cancel{16x}^4}$$

$$\frac{1}{4(x-2)} \quad x \neq \pm 2, 0$$

$$3. \frac{t-3}{t^2+9} \cdot \frac{t+3}{t^2-9} = \frac{\cancel{t-3}}{t^2+9} \cdot \frac{\cancel{t+3}}{(\cancel{t-3})(\cancel{t+3})} = \frac{1}{t^2+9} \quad \begin{array}{l} t \neq \pm 3 \\ t^2+9 \neq 0 \end{array}$$

$$5. \frac{x^2+7x+12}{x^2+3x+2} \cdot \frac{x^2+5x+6}{x^2+6x+9} = \frac{(\cancel{x+3})(x+4)}{(\cancel{x+2})(x+1)} \cdot \frac{(\cancel{x+3})(x+2)}{(\cancel{x+3})^2}$$

$$\frac{x+4}{x+1}$$

$$x \neq -2, -1, -3$$

* change into
multiplication by
the reciprocal

$$7. \frac{2x^2+3x+1}{x^2+2x-15} \div \frac{x^2+6x+5}{2x^2-7x+3}$$

$$\left\{ \begin{array}{ll} 2x^2+3x+1 & 2x^2-7x+3 \\ 2x^2+2x+x+1 & 2x^2-6x-x+3 \\ 2x(x+1)+1(x+1) & 2x(x-3)-1(x-3) \\ \underline{(2x+1)(x+1)} & \underline{(2x-1)(x-3)} \end{array} \right.$$

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

$$\frac{(2x+1)(2x-1)}{(x+5)^2}$$

$$\underline{R}$$

$$x \neq 3, -5, -1, \frac{1}{2}$$

$$9. \frac{x^2+2x-3}{x^3+8x^2+16x} \cdot \frac{3x^2+12x}{x-1}$$

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

$$\frac{3(x+3)}{(x+4)} \quad x \neq 0, -4, 1$$

$$11. \frac{a^3-27}{a^2-9} \div \frac{a}{a+3}$$

$$\frac{\cancel{(a-3)}(a^2+3a+9)}{\cancel{(a+3)}\cancel{(a-3)}} \cdot \frac{a+3}{a}$$

$$\frac{(a^2+3a+9)}{a} \quad a \neq 0, \pm 3$$

$$13. \frac{n^3+8}{n^2-4n-12} \div \frac{n^3-2n^2+4n}{n^3-6n^2}$$

$$\frac{\cancel{(n+2)}(n^2-2n+4)}{\cancel{(n-6)}(n+2)} \cdot \frac{n^2\cancel{(n-6)}}{n(n^2-2n+4)}$$

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$$n \neq 6, -2, 0$$

$$n^2-2n+4 \neq 0$$

Steps for Multiplying Rational Expressions:

1. Factor the numerators and denominators.
2. Cancel like factors. You can cancel within the fraction or cross cancel between fractions. Only in pairs. You cannot cancel factors that are both in the numerator or both in the denominator.
3. Multiply remaining factors in the numerators and remaining factors in the denominators.

****Don't forget to write restrictions.****

When dividing two rational expressions, multiply the dividend by the reciprocal and then follow the rules for multiplication. (That is, change division into multiplication and flip the second fraction.)