

Key Points

Section 2.4 Algebraic Fractions

- Canceling is really dividing a common factor from the numerator and denominator
- Canceling expressions is valid only when the factor being canceled is not zero
- Rules for operations on algebraic Fractions

Warm-Up

Section 2.4
Algebraic
Fractions

Factor: $12x^2 - 44x + 24$

$$4(3x^2 - 11x + 6)$$

$$\underline{3 \cdot 6 = 18}$$

$$\begin{array}{r} 1 \ 18 \\ -2 -9 \\ \hline 36 \end{array}$$

$$3x^2 - 9x - 2x + 6$$

$$(3x^2 - 9x) + (-2x + 6)$$

$$3x(x-3) - 2(x-3)$$

$$4(3x-2)(x-3)$$

Discussion

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Algebraic
Fractions

What are some things that you know about fractions?

Can be simplified

can be represented as decimals

division problems.

Numerator
denominator

part
whole

To add or subtract
must have common
denominator

Multiply Straight
across

Divide: Skip
Flip
multiply

Examples

Section 2.4 Algebraic Fractions

When we are dealing with algebraic fractions, the easiest way to approach them is to first see if anything can factor out, if something factors out it will make the fraction easier to work with.

$$\frac{10x+10}{5}$$

$$\frac{\cancel{5}(2x+2)}{\cancel{5}} = 2x+2 = 2(x+1)$$

$$\frac{2\cancel{10}(x+1)}{\cancel{5}} = 2(x+1)$$

Examples

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$$\frac{4m-8n}{-6m-3n}$$

$$\frac{4(m-2n)}{3(-2m-n)}$$

$$\frac{4(m-2n)}{-3(2m+n)}$$

Examples

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Fractions

$$\frac{6+x}{2x+12}$$

$$\frac{6+x}{2(x+b)} = \frac{\cancel{x+b}}{2\cancel{(x+b)}} = \left(\frac{1}{2}\right)$$

$$\frac{1}{2}$$

Examples

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Fractions

$$\frac{2}{x+y} \bullet \frac{x^2 y}{5}$$

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

Examples

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Fractions

$$\frac{t^2 - 4t + 3}{t^2 - 4} \cdot \frac{t - 2}{t - 3}$$

$$\begin{array}{l} t^2 - 4t + 3 \\ \frac{3}{13} (t-1)(t-3) \\ -1-3 \\ \hline t^2 - 4 \\ (t+2)(t-2) \end{array}$$

$$\begin{array}{l} \frac{(t-1)(\cancel{t-3})}{(t+2)(\cancel{t-2})} \cdot \frac{\cancel{t-2}}{\cancel{t-3}} \\ \hline \frac{t-1}{t+2} \end{array}$$

Examples

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Fractions

$$\begin{array}{r}
 -12 \\
 -1 \ 12 \\
 -2 \ 6 \\
 -3 \ 4 \\
 1 \ -12 \\
 2 \ -6 \\
 \hline
 3 \ -9 \ 1
 \end{array}$$

$$\frac{(x^2 - x - 12)/4x}{(x^2 + 2x - 3)/4x - 4}$$

$$\frac{x^2 - x - 12}{4x} \div \frac{x^2 + 2x - 3}{4x - 4}$$

$$\frac{x^2 - x - 12}{4x} \cdot \frac{4x - 4}{x^2 + 2x - 3}$$

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

$$\begin{array}{r}
 -3 \\
 1 \ -3 \\
 \hline
 -1 \ 3
 \end{array}$$

Practice

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Fractions

Simplify

$$\frac{6x-6}{3}$$

$$\frac{2\cancel{3}(x-1)}{\cancel{3}} = 2(x-1)$$

Practice

Section 2.4

Algebraic
Fractions

Simplify

$$\frac{10m+20n}{-15m-5n}$$

$$\frac{-2\cancel{10}(m+2n)}{-\cancel{5}(3m+n)}$$

$$\frac{-2(m+2n)}{(3m+n)}$$

$$\frac{2(m+2n)}{-3m-n}$$

Practice

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1-11 odd

14-24 even

25-35 all

51-55 all

Simplify

$$\frac{5a^3+10a}{10a^2+20}$$

$$\frac{5a(a^2+2)}{10(a^2+2)}$$

$$\frac{1\cancel{5}a}{2\cancel{10}} \quad \left(\frac{1a}{2} \text{ or } \frac{a}{2} \right)$$

$$\#5 \quad -\frac{1}{x} - \frac{1}{-x} + \frac{-1}{-x}$$

$$-\cancel{\frac{1}{x}} + \cancel{\frac{1}{x}} + \frac{1}{x}$$

$$\#11 \quad \frac{\frac{1}{3}r + \frac{r}{4}}{\frac{2r}{5} - \frac{1}{11}(3r)} = \frac{4\left(\frac{r}{3}\right) + \left(\frac{r}{4}\right)^3}{\left(\frac{2r}{5}\right) - \left(\frac{3r}{11}\right)^5} = \frac{\frac{4r}{12} + \frac{3r}{12}}{\frac{22r}{55} - \frac{15r}{55}} = \frac{\frac{7r}{12}}{\frac{7r}{55}}$$

$$\frac{7r}{12} \div \frac{7r}{55} = \frac{7r}{12} \cdot \frac{55}{7r} = \frac{55}{12}$$

Practice

Section 2.4
Algebraic
Fractions

Factor and simplify $\frac{3-x}{2x-6}$

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

$$= -\frac{1}{2}$$

Practice

Section 2.4
Algebraic
Fractions

Factor and simplify $\frac{2k^2-8}{2-k}$

$$\frac{2(k^2-4)}{-k+2} = \frac{2(\cancel{k-2})(k+2)}{-1(\cancel{k-2})}$$

$$\frac{2(k+2)}{-1} = -2(k+2)$$

Practice

Section 2.4
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Fractions

Express as a single fraction

$$\frac{j}{7} + \frac{2j}{7}$$

$$\frac{1j+2j}{7}$$

$$\frac{3j}{7}$$

Practice

Section 2.4
Algebraic
Fractions

Express as a sum of two algebraic fractions

$$\frac{5x+y}{6}$$

$$\frac{5x}{6} + \frac{y}{6}$$

Practice

Section 2.4
Algebraic
Fractions

Simplify the expression

$$30\left(\frac{c}{25}\right) + \left(\frac{h}{30}\right)25$$

$$\frac{30c}{750} + \frac{25h}{750}$$

$$\frac{30c + 25h}{750} = \frac{\cancel{5}(6c + 5h)}{\cancel{750}^{150}} = \frac{6c + 5h}{150}$$

Practice

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Express as a single fraction.

$$p+2 \left(\frac{3}{p} \right) + \left(\frac{2}{p+2} \right) p$$

$$\frac{3(p+2)}{p(p+2)} + \frac{2p}{p(p+2)}$$

$$\frac{3p+6+2p}{p(p+2)} = \frac{5p+6}{p(p+2)}$$

Practice

Section 2.4
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Express as a single fraction

$$(s-t)\left(\frac{t}{s+t}\right) - \left(\frac{s}{s-t}\right)(s+t)$$

$$\frac{t(s-t)}{(s-t)(s+t)} - \frac{s(s+t)}{(s-t)(s+t)}$$

$$\frac{st-t^2}{(s-t)(s+t)} - \frac{s^2+st}{(s-t)(s+t)}$$

$$\frac{\cancel{st} - t^2 - s^2 - \cancel{st}}{(s-t)(s+t)} = \frac{-t^2 - s^2}{(s-t)(s+t)}$$

Practice

Section 2.4 Algebraic Fractions

Express as a single fraction

$$\frac{3}{v+w} \rightarrow \frac{3vw^2}{7(v+w)}$$

$$\begin{aligned} \frac{3/(v+w)}{vw^2/7} &= \frac{3}{v+w} \div \frac{vw^2}{7} \\ &= \frac{3}{v+w} \cdot \frac{7}{vw^2} = \frac{21}{vw^2(v+w)} \end{aligned}$$

Practice

Section 2.4
Algebraic
Fractions

$$\begin{array}{r} -6 \\ \hline -2 \ 3 \\ 2 \ -3 \\ \hline -1 \ 6 \\ 1 \ -6 \end{array}$$

Express as a single fraction

$$\frac{z^2+z-6}{z^2-1} * \frac{z-1}{z-2}$$

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

$$\frac{z+3}{z+1}$$

Practice

Section 2.4
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Express as a single fraction

$$\frac{(r^2 - 25)/5r}{(r^2 - 10r + 25)/(5r - 25)}$$

Homework

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1-11 odd, 14-24 even, 25-35, 51-55

