

Solving Rational Equations

Solving rational equations is all about canceling out denominators, so you don't have to work with fractions anymore. Whenever you see a complicated fraction in an equation, multiply every term by the denominator, canceling and simplifying wherever you can. Make sure all the terms are factored and anything that can be canceled is canceled.

Evaluate.

<p>EXAMPLE</p> $\frac{3}{x-7} = 2$ <p>Multiply by the denominator to cancel.</p> $\begin{aligned} (x-7) \frac{3}{(x-7)} &= 2(x-7) \\ 3 &= 2x-7 \\ 10 &= 2x \\ 5 &= x \\ x &= \boxed{5} \end{aligned}$	<p>1.</p> $\frac{12}{x+6} = 4$	<p>2.</p> $\frac{18}{x-3} = 6$
<p>EXAMPLE</p> $\frac{8}{x+2} - 5 = 6$ <p>Multiply the denominator to every term in order to get rid of the fraction.</p> $\begin{aligned} (x+2) \frac{8}{x+2} - 5(x+2) &= 6(x+2) \\ 8 - 5x - 10 &= 6x + 12 \\ -5x - 2 &= 6x + 12 \\ -5x &= 6x + 14 \\ -11x &= 14 \\ x &= \boxed{-\frac{14}{11}} \end{aligned}$	<p>3.</p> $3 + \frac{6}{x-5} = 4$	<p>4.</p> $\frac{7}{x+8} + 2 = 9$
<p>EXAMPLE</p> $\frac{4}{(x+1)(x-3)} = \frac{5}{x+1}$ <p>There are two denominators to cancel. Start with the one on the left. Multiply.</p> $\frac{(x+1)(x-3) 4}{(x+1)(x-3)} = \frac{5(x+1)(x-3)}{x+1}$ $4 = 5(x-3)$ <p>All of the fractions are gone, so now we'll just simplify.</p> $\begin{aligned} 4 &= 5x - 15 \\ 19 &= 5x \\ \frac{19}{5} &= x \\ x &= \boxed{\frac{19}{5}} \end{aligned}$	<p>5.</p> $\frac{10}{(x-6)(x+4)} = \frac{3}{x+4}$	<p>6.</p> $\frac{2}{(x+9)(x+2)} = \frac{5}{x+2}$

<p>EXAMPLE</p> $\frac{11}{x+10} = \frac{7}{(x+10)(x-3)}$ <p>Start with the denominator on the left</p> $\frac{\cancel{(x+10)} 11}{x+10} = \frac{7 \cancel{(x+10)}}{\cancel{(x+10)}(x-3)}$ $11 = \frac{7}{x-3}$ <p>Multiply the denominator that's left.</p> $(x-3)(11) = \frac{7\cancel{(x-3)}}{\cancel{x-3}}$ $11x - 33 = 7$ $11x = 40$ $x = \boxed{\frac{40}{11}}$	<p>7.</p> $\frac{4}{x-9} = \frac{4}{(x-9)(x+3)}$	<p>8.</p> $\frac{9}{x+2} = \frac{7}{(x+2)(x-11)}$
<p>EXAMPLE</p> $\frac{5}{x+4} - \frac{3}{x+2} = \frac{6}{(x+4)(x+2)}$ <p>Multiply by the denominators one at a time until they're all canceled.</p> $\frac{\cancel{(x+4)} 5}{x+4} - \frac{(x+4) 3}{x+2} = \frac{\cancel{(x+4)} 6}{\cancel{(x+4)}(x+2)}$ $5 - \frac{3(x+4)}{x+2} = \frac{6}{x+2}$ $(x+2) 5 - \frac{3(x+4)\cancel{(x+2)}}{\cancel{x+2}} = \frac{6\cancel{(x+2)}}{\cancel{x+2}}$ $5x + 10 - 3(x+4) = 6$ $5x + 10 - 3x - 12 = 6$ $2x - 2 = 6$ $2x = 8$ $x = \boxed{4}$	<p>9.</p> $\frac{6}{x-3} + \frac{8}{x-7} = \frac{10}{(x-3)(x-7)}$	<p>10.</p> $\frac{4}{x-2} + \frac{6}{x+9} = \frac{3}{(x-2)(x+9)}$
<p>EXAMPLE</p> $\frac{2}{x^2+7x+12} = \frac{5}{4x+16}$ <p>Start by factoring the denominators.</p> $\frac{2}{(x+3)(x+4)} = \frac{5}{4(x+4)}$ <p>Multiply by each denominator, one at a time.</p> $\frac{\cancel{(x+3)}(x+4) 2}{\cancel{(x+3)}(x+4)} = \frac{5(x+3)\cancel{(x+4)}}{4\cancel{(x+4)}}$ $2 = \frac{5(x+3)}{4}$ $(4)2 = \frac{5(x+3)(4)}{4}$ $8 = 5x + 15$ $-7 = 5x$ $-\frac{7}{5} = x$ $x = \boxed{-\frac{7}{5}}$	<p>11.</p> $\frac{4}{x^2-9x+18} = \frac{3}{5x-15}$	<p>12.</p> $\frac{12}{x^2+5x-24} = \frac{7}{2x+16}$