

## RATIONAL & RADICAL EQUATIONS

Rational Expressions & Equations			
Topics	Type	Steps / Things to Remember	Example
<b>Rational Expressions</b>	Adding or Subtracting	<ul style="list-style-type: none"> <li>- Find least common denominator first!</li> <li>- Then multiply each term by what is missing from the LCD (numerator and denominator)</li> </ul>	$\frac{10}{2x^2} + \frac{5}{3x} \Rightarrow \frac{3}{3} \cdot \frac{10}{2x^2} + \frac{5}{3x} \cdot \frac{2x}{2x}$ $\Rightarrow \frac{30}{6x^2} + \frac{10x}{6x^2} = \boxed{\frac{30 + 10x}{6x^2}}$ <p style="text-align: right; color: blue;"><i>LCD = 6x<sup>2</sup></i></p>
	Multiplying	<ol style="list-style-type: none"> <li>1. <b>Factor First!</b></li> <li>2. <b>Reduce</b></li> <li>3. <b>Multiply straight across</b></li> </ol>	$\frac{6a}{3a+15} \cdot \frac{4a+20}{2a^2} \Rightarrow \frac{\overset{2}{6}\cancel{a}}{\underset{1}{3}\cancel{(a+5)}} \cdot \frac{\overset{2}{4}\cancel{(a+5)}}{\underset{a}{2}a^2} \Rightarrow \frac{2}{1} \cdot \frac{2}{a} = \boxed{\frac{4}{a}}$
	Dividing	<ol style="list-style-type: none"> <li>1. Flip the 2nd fraction first (KCF)</li> <li>2. <b>Factor</b></li> <li>3. <b>Reduce</b></li> <li>4. <b>Multiply straight across</b></li> </ol>	$\frac{6x+18}{4} \div \frac{x^2+3x}{5x^2} \Rightarrow \frac{6x+18}{4} \cdot \frac{5x^2}{x^2+3x} \Rightarrow \frac{\overset{3}{6}\cancel{(x+3)}}{\underset{2}{4}} \cdot \frac{\overset{x}{5}\cancel{x^2}}{\cancel{x}(x+3)} = \boxed{\frac{15x}{2}}$
<b>Rational Equations</b>	<i>*for equations only</i>	<ol style="list-style-type: none"> <li>1. Multiply each term (on both sides of the equal sign) by the LCD</li> <li>2. Cancel out denominators by simplifying</li> <li>3. Solve for unknown variable</li> <li>4. Reject any extraneous solutions</li> </ol>	$\frac{5}{x} - \frac{1}{3} = \frac{1}{x} \quad \leftarrow \text{Restriction : } x \neq 0$ <p style="text-align: right; color: blue;"><i>LCD = 3x</i></p> $3x \cdot \left( \frac{5}{x} - \frac{1}{3} \right) = 3x \cdot \left( \frac{1}{x} \right)$ $3x \cdot \frac{5}{x} - 3x \cdot \frac{1}{3} = 3x \cdot \frac{1}{x}$ $15 - x = 3$ $-x = -12$ $x = 12$

## RADICAL EQUATIONS

Topic	Type	Rule /Goals	Example
<b>Solving Equations with Radicals</b>	Radical on <u>ONE</u> side of the equal side	<ol style="list-style-type: none"> <li>1. Isolate the radical term (using inverse operations)</li> <li>2. Raise the entire radical term to it's inverse (exponent) to 'cancel out' the radical</li> <li>3. Simplify and solve for unknown variable</li> <li>4. Always check for extraneous solutions</li> </ol>	$\sqrt[3]{x^2 + 4} - 2 = 0$ <p style="text-align: right;"><i>Isolate the radical.</i></p> $\sqrt[3]{x^2 + 4} = 2$ $(\sqrt[3]{x^2 + 4})^3 = (2)^3$ <p style="text-align: right;"><i>Cube both sides.</i></p> $x^2 + 4 = 8$ <p style="text-align: right;"><i>Solve.</i></p> $x^2 - 4 = 0$ $(x + 2)(x - 2) = 0$ $x + 2 = 0 \quad \text{or} \quad x - 2 = 0$ $x = -2 \qquad \qquad x = 2$