## 5.4 Solving Rational Equations

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| **A Rational Equations**<br><br>To solve a rational equation:<br>▪ State restrictions<br>▪ Multiply by the LCD (Least Common Denominator)<br>▪ Solve the polynomial equation (algebraically or by using technology)<br>▪ Verify restrictions<br>▪ Verify your solutions by substitution | Ex 1. Solve the following rational equation:<br><br>$\frac{x}{x-2}-\frac{2}{x+3}=\frac{10}{x^2+x-6}$ |
| **B Cross Multiplication**<br>A rational equation of the form: $\frac{P(x)}{Q(x)}=\frac{R(x)}{S(x)}$, where $P(x)$, $Q(x)$, $R(x)$, and $S(x)$ are polynomial functions, may be solve by cross-multiplication:<br><br>$\frac{P(x)}{Q(x)}=\frac{R(x)}{S(x)} \Leftrightarrow P(x)S(x)=Q(x)R(x)$<br><br>Note. Do not forget to state and verify restrictions. | Ex 2. Use cross-multiplication to solve:<br><br>$\frac{x-1}{2x+3}=\frac{x+2}{3x-2}$ |
| **C Shortcut**<br>A rational equation of the form $\frac{P(x)}{Q(x)}=0$ is equivalent (if restrictions are satisfied) to the equation:<br><br>$P(x)=0$<br><br>Note. Do not forget to state and verify restrictions. | Ex 3. Solve for $x$.<br><br>$\frac{x^2+x-2}{x^2-1}=0$ |


 

**D No solution**

A rational equation of the form:

$$\frac{constant}{P(x)} = 0$$

does not have any solution.

Ex 4. Solve for $x$.

$$\frac{2}{2x-1} + \frac{1}{1-x} = 0$$

Ex 5. Solve for $x$.

a) $1 + x + \frac{4}{x} = \frac{9}{x-1}$

b) $\frac{2x^3 - 1}{4 - x^2} = \frac{x}{x+2}$

Ex 6. Solve for $x$.

a) $\dfrac{\frac{x}{x-1} + \frac{x}{x+1}}{\frac{3}{x+1} - \frac{2}{x-1}} = \frac{3x+2}{x-5}$

b) $\frac{|x-1|}{x+1} + \frac{x+2}{|x-2|} = 3$

**Reading**: Nelson Textbook, Pages 278-285
**Homework**: Nelson Textbook, Page 285: #1, 2a, 3d, 5c, 6c, 7f, 13, 15


 