### A Rational Equations

To solve a rational equation:
- State restrictions
- Multiply by the LCD (Least Common Denominator)
- Solve the polynomial equation (algebraically or by using technology)
- Verify restrictions
- Verify your solutions by substitution

**Ex 1.** Solve the following rational equation:
\[
\frac{x - 2}{x + 3} = \frac{10}{x^2 + x - 6}
\]

### B Cross Multiplication

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:

\[
\frac{P(x)}{Q(x)} = \frac{R(x)}{S(x)} \quad \Leftrightarrow \quad P(x)S(x) = Q(x)R(x)
\]

Note. Do not forget to state and verify restrictions.

**Ex 2.** Use cross-multiplication to solve:
\[
\frac{x - 1}{2x + 3} = \frac{x + 2}{3x - 2}
\]

### C Shortcut

A rational equation of the form \( \frac{P(x)}{Q(x)} = 0 \) is equivalent (if restrictions are satisfied) to the equation:

\[ P(x) = 0 \]

Note. Do not forget to state and verify restrictions.

**Ex 3.** Solve for \( x \).
\[
\frac{x^2 + x - 2}{x^2 - 1} = 0
\]
### No solution

A rational equation of the form: \( \frac{\text{constant}}{P(x)} = 0 \)

does not have any solution.

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### Ex 4. Solve for \( x \).

\[
\frac{2}{2x-1} + \frac{1}{1-x} = 0
\]

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### Ex 5. Solve for \( x \).

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

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

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### Ex 6. Solve for \( x \).

a) \[
\frac{x}{x-1} + \frac{x+1}{x+1} = \frac{3x+2}{x-5}
\]

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

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**Reading:** Nelson Textbook, Pages 278-285

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