Solving Fractional Equations

\[
\frac{x+3}{3-x} + \frac{11x+3}{x^2-9} = \frac{-5x}{x+3}
\]

To identify a fractional (rational) equation …

• Look at the denominators of the equation.
• If there is a VARIABLE in the denominator, then it is a fractional equation.

Special Consideration:
• The denominator of a fraction CANNOT EQUAL ZERO because that would make the term UNDEFINED.
• Therefore, when there is a variable in the denominator, there are values that the variable CANNOT EQUAL.
• DOMAIN:
  ○ The values that the variable CAN EQUAL.
  • When we state the domain at the beginning of the problem, we are noting what the variable CAN EQUAL, which in turn tells us what it cannot equal.

EXTRANEOUS ROOT:
• Is a root of the manipulated equation which does NOT satisfy the original equation.
• For a fractional equation, there is an extraneous root if the root is NOT A MEMBER OF THE DOMAIN.

STEPS:
(1) Find the LCD.
• May need to factor the denominators.
• May need to get rid of negative exponents.
  \[ \text{LCD} : (x+3)(x-3) \]

(2) Multiply each term of the equation by the LCD.
• Cancel all denominators.

(3) Solve the resulting polynomial equation.

(4) Compare your solution to the domain you have stated.
• Note if any of the roots are extraneous.
• Only the roots that are NOT extraneous are considered solutions.
  ○ Those roots go in the solution set!