➢ **Recall**: A rational function is a function that can be written as the ratio of two polynomials where the denominator does not equal zero: $f(x) = \dfrac{p(x)}{q(x)}$ where $q(x) \neq 0$

➢ When solving rational equations with variables in the denominator, you must check the solution to be sure the denominator will not equal zero. **The solution will be eliminated if the denominator is zero**.

Examples: Solve for x.

LCD: $x(x-7)$

**1.** $\dfrac{6}{x} = \dfrac{3}{7}$

$\dfrac{42}{3} = \dfrac{3x}{3}$

$x = 14$ ✓

Desmos:

1: $\dfrac{6}{x}$

2: $y = \dfrac{3}{7}$

3: Locate x-value of int.

$x = $ _____

**2.** $\dfrac{x}{x} \cdot \dfrac{4}{x-7} = \dfrac{6}{x} \cdot \dfrac{(x-7)}{(x-7)}$

$\dfrac{4x}{x(x-7)} = \dfrac{6x-42}{x(x-7)}$  ✓

$4x = 6x - 42$    $x = 21$
$-6x \quad -6x$
$\dfrac{-2x}{-2} = \dfrac{-42}{-2}$

$x = $ _____

**3.** $\dfrac{-5}{x+4} = \dfrac{1}{x+4}$

$-5 \neq 1$

$\varnothing$

b/c they don't intersect

$x = $ _____

LCD: $6(x+5)$

**4.** $\dfrac{6}{6} \cdot \dfrac{4}{x+5} = \dfrac{x}{6} \cdot \dfrac{(x+5)}{(x+5)}$

$\dfrac{24}{6(x+5)} = \dfrac{x^2+5x}{6(x+5)}$

$24 = x^2 + 5x$
$-24 \qquad\qquad -24$

$0 = x^2 + 5x - 24$
$0 = (x+8)(x-3)$
$x = -8 \quad x = 3$ ✓ ✓

$x = $ _____

LCD: 12

**5.** $\dfrac{3}{3} \cdot \dfrac{(x-4)}{4} + \dfrac{x}{3} \cdot \dfrac{4}{4} = 6 \cdot \dfrac{12}{12}$

$\dfrac{3x-12}{12} + \dfrac{4x}{12} = \dfrac{72}{12}$

$3x - 12 + 4x = 72$    $x = 12$ ✓

$7x - 12 = 72$
$+12 \; +12$

$\dfrac{7x = 84}{7 \quad 7}$

$x = $ _____

LCD: $2x(x+1)$

**6.** $\dfrac{(x+1)}{(x+1)} \cdot \dfrac{3}{2x} - \dfrac{2x}{x+1} \cdot \dfrac{2x}{2x} = -2 \cdot \dfrac{2x(x+1)}{2x(x+1)}$

$3x + 3 - 4x^2 = -4x(x+1)$

$-4x^2 + 3x + 3 = -4x^2 - 4x$
$+4x^2 \qquad -3 \qquad +4x^2 \quad -3$

$\dfrac{3}{-7} = \dfrac{-7x}{-7}$    $x = -\dfrac{3}{7}$ ✓

$x = $ _____

➢ Solve for x:

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1. $\dfrac{3}{x} = \dfrac{2}{x+4}$

$x =$ _____

2. $\dfrac{x+1}{2x+5} = \dfrac{2}{x}$

$x =$ _____

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3. $\dfrac{3}{x+2} + 5 = \dfrac{4}{x+2}$

LCD:
$(x+2)$

$3 + 5x + 10 = 4$

$5x + 13 = 4$

$\dfrac{5x}{5} = \dfrac{-9}{5}$

$\boxed{x = \dfrac{-9}{5}} \checkmark$

$x =$ _____

4. $\dfrac{6}{x-3} = \dfrac{x}{18}$

$x =$ _____

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5. $\dfrac{5x}{x+2} + \dfrac{2}{x} = 5$

$\boxed{\sqrt{x+3} = 2}$

$x =$ _____

6. $\dfrac{2}{2} \cdot \dfrac{2x-3}{7} - \dfrac{x}{2} = \dfrac{x+3}{14}$   LCD:14

$4x - 6 - 7x = x + 3$

$-3x - 6 = x + 3$
$\phantom{-3x} -x + 4 \quad -x + 6$

$\dfrac{-4x}{-4} = \dfrac{9}{-4} \quad \boxed{x = -\dfrac{9}{4}} \checkmark$

$x =$ _____