

# Solving Rational Equations

Rational Equation  $\rightarrow$  equation containing fractions.

\* If the fraction has a variable in the denominator, we must be mindful of the values that are restricted, i.e. the values that make the denominator zero.

Ex. What values must be rejected from the solution set of

$$\frac{3}{x+2} - \frac{5}{x} = 1 \quad ?$$

$$x+2=0$$

$$x = -2$$

$$x = 0$$

## Steps to Solve a Rational Eq.

- ① Find the LCD.
- ② Multiply both sides of the eq. by the LCD.
- ③ Solve the resulting eq. (linear or quadratic).
- ④ Reject any solutions that make the denominator 0.

Ex Solve

$$\text{LCD} = y$$

$$\textcircled{1} \quad \frac{4}{y} + \frac{1}{y} = 2$$

$$y \left( \frac{4}{y} + \frac{1}{y} \right) = y(2)$$

$$y \left( \frac{4}{y} \right) + y \left( \frac{1}{y} \right) = 2y$$

$$4 + 1 = 2y$$

$$\frac{5}{2} = \frac{2y}{2}$$

$$\textcircled{y = \frac{5}{2}}$$

$\left\{ \frac{5}{2} \right\}$

②

$$\frac{r-5}{2} = \frac{r+2}{3}$$

$$\text{LCD} = 6$$

$$3 \cdot \frac{r-5}{2} = 2 \cdot \frac{r+2}{3}$$

$$\begin{array}{r} 3r - 15 = 2r + 4 \\ -2r \quad -2r \\ \hline \end{array}$$

$$\begin{array}{r} r - 15 = 4 \\ +15 \quad +15 \\ \hline r = 19 \end{array}$$

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$$\textcircled{3} \quad \frac{k}{k-4} - 5 = \frac{4}{k-4} \quad \text{LCD} = k-4$$

$$\cancel{(k-4)} \left( \frac{k}{\cancel{k-4}} \right) - \overbrace{5(k-4)} = \frac{4}{\cancel{k-4}} \cancel{(k-4)}$$

$$k - 5k + 20 = 4$$

$$\begin{array}{r} -4k + 20 = 4 \\ -20 \quad -20 \end{array}$$

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$$\begin{array}{r} -4k = -16 \\ \hline -4 \quad \quad -4 \end{array}$$

$\emptyset$

~~$k=4$~~

$$\textcircled{4} \quad \frac{2}{t^2-4} = \frac{3}{t^2-2t}$$

$$\text{LCD} = t(t-2)(t+2)$$

$$\frac{2}{(t-2)(t+2)} = \frac{3}{t(t-2)}$$

$$t \cancel{(t-2)} \cancel{(t+2)} \frac{2}{\cancel{(t-2)} \cancel{(t+2)}} = \frac{\cancel{t} \cancel{(t-2)} \cancel{(t+2)} 3}{\cancel{t} \cancel{(t-2)}} \quad \left\{ \begin{array}{l} \\ \\ \\ \end{array} \right. \begin{array}{l} \\ \\ \\ \end{array}$$

$$\begin{array}{r} 2t = 3t + 6 \\ -3t \quad -3t \\ \hline \end{array}$$

$$\begin{array}{r} -t = 6 \\ \hline -1 \quad -1 \\ \hline \end{array} \quad \textcircled{t = -6}$$

$$\textcircled{5} \quad \frac{3}{r+3} - \frac{2}{r-3} = \frac{-12}{r^2-9} \quad \text{LCD} = \begin{matrix} (r+3) \\ (r-3) \end{matrix}$$

$$\frac{3}{\cancel{r+3}} \frac{\cancel{(r+3)}(r-3)}{\cancel{(r-3)}} - \frac{2}{\cancel{r-3}} \frac{(r+3)\cancel{(r-3)}}{\cancel{(r-3)}} = \frac{-12 \cancel{(r+3)}\cancel{(r-3)}}{\cancel{(r+3)}\cancel{(r-3)}}$$

$$3r - 9 - 2r - 6 = -12$$

$$\begin{array}{r} r - 15 = -12 \\ + 15 \quad + 15 \end{array}$$

$$\cancel{r = 3}$$

