Solving Equations Containing Radical Expression

1. \( \frac{3}{x-12} - \frac{5x}{x^2-144} = \frac{2}{x+12} \)

   \( x - 12 = 0 \quad x^2 - 144 = 0 \quad x + 12 = 0 \)
   \( x = 12 \quad (x+12)(x-12) \quad x = -12 \)

   \( x + 12 = 0 \quad x - 12 = 0 \)
   \( x = -12 \quad x = 12 \)

   \( x = -12 \) and \( 12 \) are not allowed to be in our final answers.

2. \( \frac{3}{x-12} - \frac{5x}{(x+12)(x-12)} = \frac{2}{x+12} \)

   \( \text{LCD} = (x+12)(x-12) \)

3. \( 3(x+12) - 5x = 2(x-12) \) \( \rightarrow \) Dev. Math 1 Problem

   \( 3x + 36 - 5x = 2x - 24 \)

4. \( 3x - 5x - 2x = -24 - 36 \)

   \( -4x = -60 \)

   \( x = 15 \)
3. 6.5 (cont'd)

(lecture. Notes p. 104)

Solving Equations Containing Rational Expression

\[ \frac{3}{x-12} - \frac{5x}{x^2-144} = \frac{2}{x+12} \]

1. Set
   \[ \frac{3}{x-12} = \frac{5x}{(x+12)(x-12)} = \frac{2}{x+12} \]

   \[ x-12 = 0 \]
   \[ x^2-144 = 0 \]
   \[ x+12 = 0 \]

   \[ x = 12 \]
   \[ (x+12)(x-12) \]
   \[ x = -12 \]

   \[ x = -12 \text{ and } 12 \text{ are not allowed to be in our final answers.} \]

2. LCD: \((x+12)(x-12)\)

   \[ \frac{3}{x-12} - \frac{5x}{(x+12)(x-12)} = \frac{2}{x+12} \]

   \[ (x+12)(x-12), \frac{3}{x-12} - (x+12)(x-12), \frac{5x}{(x+12)(x-12)} = \frac{2}{x+12} \]

   \[ (x+12)(x-12) \]

3. \[ 3(x+12) - 5x = 2(x-12) \]

   \[ 3x + 36 - 5x = 2x - 24 \]

4. \[ 3x - 5x - 2x = -24 - 36 \]

   \[ -4x = -60 \]

   \[ x = 15 \]
\[
\frac{3}{x-12} - \frac{5y}{x^2-144} = \frac{2}{x+12}
\]

\[
\frac{3}{15-12} - \frac{5(15)}{15^2-144} = \frac{2}{15+12}
\]

\[1 - \frac{75}{225-144} = \frac{2}{27}\]

\[1 - \frac{75}{81} = \frac{2}{27}\]

\[\frac{81}{81} = \frac{75}{81} - \frac{2}{27}\]

\[\frac{6}{81} - \frac{2}{27}\]

\[\frac{2}{27} = \frac{2}{27}\]

29 \text{ Solve the equation}

\[-4 + 2 = y\]

1 \text{ denom set } \neq 0 \text{ to find forbidden } #s

\[set \quad 3y+1 = 0\]
\[ y = \frac{1}{3} \text{ is not allowed to be our answer} \]

2. \[ \text{L.C.D. } 3y+1 \]

\[ (3y+1) \left( \frac{-4}{3y+1} + 2 \right) = (y) (3y+1) \]

\[ \frac{(3y+1) \cdot -4}{3y+1} + (3y+1)(2) = 3y^2 + y \]

\[ -4 + 6y + 2 = 3y^2 + y \]

Goal: \( b = 0 \)

6y - 2 = 3y^2 + y

-6y + 2

\[ 0 = 3y^2 - 5y + 2 \]

Factor

\[ \Rightarrow (3y - 2)(y - 1) \]

3y - 2 = 0

\[ y = \frac{2}{3} \]

\[ y = 1 \]

Check if work.

\[ y = \frac{2}{3} \]
\[-\frac{4}{3y+1} + 2 = y\]

Check:
\[y = \frac{2}{3}\]

\[-\frac{4}{3\left(\frac{2}{3}\right)+1} + 2 \neq \frac{2}{3}\]

\[-\frac{4}{3} + \frac{6}{3} = \frac{2}{3}\]

\[\frac{2}{3} = \frac{2}{3}\]

Check:
\[y = 1\]

\[-\frac{4}{3(1)+1} + 2 = 1\]

\[-1 + 2 = 1\]

\[1 = 1\]

26. \[\frac{x+3}{x-4} = \frac{7}{x-4}\]

LCM = \(x-4\)

\[\frac{(x-4) \cdot (x+3)}{(x-4)} = \frac{7}{(x-4)} \cdot (x-4)\]
\[
\begin{align*}
\frac{x + 3}{x - 4} &= \frac{7}{x - 4} \\
\frac{7}{7} - \frac{7}{7} &= \frac{7}{7} - \frac{7}{7} \\
\text{Recall that,} \\
\frac{x + 3}{x - 4} &= \frac{7}{x - 4} \\
x &= 4, \quad x = 4 \\
\end{align*}
\]

\(4\) is our forbidden number.

\(x\) cannot equal 4 (No solution)
3.7.1 Radicals and Radical Functions

(Lect pg 110)

Find square roots, cube roots, and 7th roots of numbers.

* $\sqrt[3]{3} = 1.44224957$

$\sqrt{3}$ = continues forever

So for an accurate answer leave it as $\sqrt[3]{3}$

(14, 22, 25) Auscultors.

Log answers:

\[ \sqrt[4]{16} = 2 \quad \sqrt[2]{2} \cdot \sqrt[2]{2} \cdot \sqrt[2]{2} = 16 \]

\[ \sqrt{100} = 10 \quad \sqrt[10]{10} \cdot 10 = 100 \]

\[ \sqrt[3]{-8} = -2 \quad -2 \cdot -2 \cdot -2 = -8 \]

Using a TI-84 Plus Calculator to find roots of #5
For a \( \sqrt{} \) (square root) hit \( \text{2nd} \) \( \text{X}^2 \) buttons.

For \( n \) th roots, press your number then \( \text{MATH} \), 5.

12. \( \sqrt{\frac{1}{81}} = \frac{1}{3} \)

14. \(-\sqrt{100} \equiv -10\)

17. \( \sqrt{19} \equiv 4.359 \)

22. \( 3 \sqrt{8} \equiv -2 \)

25. \(-\sqrt{16} \equiv -2 \)

26. \( 4 \sqrt{-16} \equiv \text{not real} \)

27. \( \sqrt{-a43} \equiv -3 \)

Even \( i \sqrt{\text{negative}} \equiv \text{not real} \)
\[ n \sqrt{a} \]  

Index

Index is "n"  
Radicand is "a"

Root of Negative #s

"Odd" index of a negative # answer is negative  
"Even" index of a negative # is NOT real

a) \( \sqrt[3]{13} \)  
   positive

b) \( \sqrt[5]{17} \)  
negative

c) \( \sqrt[10]{10} \)  
not a real

d) \( \sqrt{-2} \)  
not a real #

e) \( 3\sqrt[3]{-1} \)  
negative