10/29/2012 - Sec 8.6 Math 100

#100

#45 #45 $\dfrac{15}{\sqrt{3}} \cdot \dfrac{\sqrt{3}}{\sqrt{3}} = \dfrac{5\cancel{15}\sqrt{3}}{\cancel{3}} = \boxed{5\sqrt{3}}$

#60

#60 $\dfrac{-4\sqrt{13}}{\sqrt{m}} \cdot \dfrac{\sqrt{m}}{\sqrt{m}} = \boxed{\dfrac{-4\sqrt{13m}}{m}}$

#100 $\dfrac{24+12\sqrt{5}}{12} = \dfrac{\cancel{12}(2+\sqrt{5})}{\cancel{12}}$

$= \boxed{2+\sqrt{5}}$

#90 $\dfrac{(\sqrt{5}+\sqrt{6})(\sqrt{3}+\sqrt{2})}{(\sqrt{3}-\sqrt{2})(\sqrt{3}+\sqrt{2})} = \dfrac{\sqrt{15}+\sqrt{10}+\sqrt{18}+\sqrt{12}}{3+\cancel{\sqrt{6}}-\cancel{\sqrt{6}}-2}$

$= \sqrt{15}+\sqrt{10}+\sqrt{18}+\sqrt{12}$

$= \boxed{\sqrt{15}+\sqrt{10}+3\sqrt{2}+2\sqrt{3}}$

15 = 3 · 5

10 = 2 · 5

18 = 2 · 9 = 2 · 3 · 3

12 = 2 · 6 = 2 · 2 · 3

Sec 8.6 Solving Equations with Radicals

Expressions: Simplified

Equations: Solved

Power Rule for Equations

If both sides of an equation are raised to the same power, all solutions of the original Equation are also solutions of the new equation.

Ex: $\sqrt{x} = 4 \Rightarrow \left(\sqrt{x}\right)^2 = (4)^2 \Rightarrow x = 16$

Note: Not every solution of the new equation has to be a solution to the original. We must check every solution!

Steps to Solving Radical Equations

1. Isolate the Radical
2. Raise both sides to an appropriate power using the Power Rule
3. Solve the Resulting Equation.
   Note: If the Result has Radicals Repeat steps 1-3
4. Check answer using the original Eq

Ex: $\sqrt{5x+1} + 3 = 9$

$-3 \quad -3$

$(\sqrt{5x+1})^2 = (6)^2$

$5x+1 = 36$

$-1 \quad -1$

$\frac{5x}{5} = \frac{35}{5}$

$x = 7$

Check:

$\sqrt{5x+1} + 3 = 9$

$\sqrt{5 \cdot 7 + 1} + 3 = 9$

$\sqrt{35+1} + 3 = 9$

$\sqrt{36} + 3 = 9$

$6 + 3 = 9$

$9 = 9$ ✓

Ex: $\sqrt{5x+3} + 2 = 0$

$-2 \quad -2$

$(\sqrt{5x+3})^2 = (-2)^2$

$5x + 3 = 4$

$-3 \quad -3$

$\frac{5x}{5} = \frac{1}{5}$

$x = \frac{1}{5}$

No Solution

Check

$\sqrt{5(\frac{1}{5})+3} + 2 = 0$

$\sqrt{1+3} + 2 = 0$

$\sqrt{4} + 2 = 0$

$2 + 2 = 0$

$4 \neq 0$

Ex: $\left(\sqrt{4-x}\right)^2 = (x+2)^2$

$4-x = (x+2)(x+2)$

$4-x = x^2+2x+2x+4$

$4-x = x^2+4x+4$

$-4+x \quad +x \quad -4$

$0 = x^2+5x$

$0 = x(x+5)$

keep ✓ $\boxed{x=0}$, $x+5=0$

$-5 \quad -5$

~~$x=-5$~~

Check

$x=0$

$\sqrt{4-0} = 0+2$

$\sqrt{4} = 2$

$2=2$ ✓

$x=-5$

$\sqrt{4+5} = -5+2$

$\sqrt{9} = -3$

$3 \neq -3$

For You

$\left(\sqrt{x^2-3x+18}\right)^2 = (x+3)^2 \quad x=1$

$x^2-3x+18 = x^2+6x+9$

$-x^2-6x-9 \quad -x^2-6x-9$

$-9x+9=0$

$-9 \quad -9$

$\frac{-9x}{-9} = \frac{-9}{-9}$ ↱ $\boxed{x=1}$

Checked ✓

Ex: $\sqrt{5x+6} + \sqrt{3x+4} = 2$

$-\sqrt{3x+4} \qquad -\sqrt{3x+4}$

$\left(\sqrt{5x+6}\right)^2 = \left(2-\sqrt{3x+4}\right)^2$

$5x+6 = (2-\sqrt{3x+4})(2-\sqrt{3x+4})$

$= 4 - 2\sqrt{3x+4} - 2\sqrt{3x+4} + (3x+4)$

$5x+6 = 8+3x-4\sqrt{3x+4}$

$+4\sqrt{3x+4} \qquad +4\sqrt{3x+4}$

$4\sqrt{3x+4} + 5x + 6 = 8 + 3x$

$-5x \quad -6 \qquad -6 \quad -5x$

$\frac{4\sqrt{3x+4}}{4} = \frac{2-2x}{4}$

$\sqrt{3x+4} = \frac{2(1-x)}{4}$

$\left(\sqrt{3x+4}\right)^2 = \left(\frac{1-x}{2}\right)^2$

$4\cdot(3x+4) = \frac{1-2x+x^2}{4}\cdot 4$

$12x+16 = 1-2x+x^2$

$-12x \quad -16 \qquad -16 \quad -12x$

$0 = x^2 - 14x - 15$

$0 = (x+1)(x-15)$

$x+1=0 \qquad x-15=0$

$x=-1 \qquad x=15$

-15 | -14

-14 | 1

Check

$\sqrt{5(-1)+6} + \sqrt{3(-1)+4} = 2$

$\sqrt{-5+6} + \sqrt{-3+4} = 2$

$\sqrt{1} + \sqrt{1} = 2$

$1+1=2$ ✓

Check

~~$x=15$~~

$\sqrt{5(15)+6} + \sqrt{3(15)+4} = 2$

$\sqrt{75+6} + \sqrt{45+4} = 2$

$\sqrt{81} + \sqrt{49} = 2$

$9+7 = 2$ ~~$\neq 2$~~

$$\left(\sqrt[3]{z+5}\right)^3 = \left(\sqrt[3]{2z-6}\right)^3$$

$$z + 5 = 2z - 6$$