3/7/2022

WeBWork Set: Rationalizing Denominators

#1) $\frac{9}{\sqrt{7}} \cdot \frac{\sqrt{7}}{\sqrt{7}} = \frac{9\sqrt{7}}{(\sqrt{7})^2} = \frac{9\sqrt{7}}{(\sqrt{7^2})}$

$= \boxed{\frac{9\sqrt{7}}{7}}$

Side note

$\sqrt{7} = 7^{1/2}$

$(7^{1/2})^2$

$= 7^{\frac{1}{2} \cdot 2}$ or

$= 7^{2 \cdot \frac{1}{2}} = 7$

#8) $\frac{6\sqrt{30}}{6-\sqrt{30}}$

to rationalize multiply numerator + denominator by $6+\sqrt{30}$

which is the conjugate of $6-\sqrt{30}$

$\frac{6\sqrt{30}\cdot(6+\sqrt{30})}{(6-\sqrt{30})(6+\sqrt{30})} = \frac{6\cdot 6\sqrt{30} + 6\cdot 30}{36 - 6\sqrt{30} + 6\sqrt{30} - 30}$

FOIL

$$\frac{36\sqrt{30}+180}{6} = \frac{6\cdot 6\sqrt{30}+6\cdot 30}{6}$$

$$= \frac{6\cdot(6\sqrt{30}+30)}{6} =$$

$$\boxed{6\sqrt{30}+30}$$

#9) $\frac{(x-5)\cdot(\sqrt{x}-\sqrt{5})}{(\sqrt{x}+\sqrt{5})\cdot(\sqrt{x}-\sqrt{5})} =$

Conjugate $\sqrt{x}-\sqrt{5}$

$$\frac{(x-5)(\sqrt{x}-\sqrt{5})}{(\sqrt{x}+\sqrt{5})(\sqrt{x}-\sqrt{5})} = \frac{x\sqrt{x}-x\sqrt{5}-5\sqrt{x}+5\sqrt{5}}{x-\sqrt{5x}+\sqrt{5x}-5}$$

$$= \frac{x\sqrt{x}-5\sqrt{x}-x\sqrt{5}+5\sqrt{5}}{x-5}$$

$$= \frac{\sqrt{x}(x-5)-\sqrt{5}(x-5)}{(x-5)}$$

Aside

$2\sqrt{2}-3\sqrt{2}$

$\sqrt{2}(2-3)$

$2\sqrt{x}-3\sqrt{x}$

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

$\sqrt{5}\cdot\sqrt{x}$

$= \sqrt{5x}$

$$= \frac{(x-5)(\sqrt{x}-\sqrt{5})}{(x-5)} = \boxed{\sqrt{x}-\sqrt{5}}$$

Radical Equations:

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Ex Solve

$$\sqrt{2x-3} = 9$$

Strategy: Square both sides!

$$\left(\sqrt{2x-3}\right)^2 = 9^2$$

$$2x-3 = 81$$

$$\boxed{x = 42}$$

$\sqrt{x} \cdot \sqrt{x} = x$

$\left(\sqrt{x}\right)^2 = x$

Catch: The solution(s) to the original equation are found amongst the solutions to your modified equation → no, guarantees you must check.

$x=42$ $\quad \sqrt{2x-3}=9$

$\sqrt{2(42)-3} \stackrel{?}{=} 9$

$\sqrt{84-3} \stackrel{?}{=} 9$

$\sqrt{81} \stackrel{\checkmark}{=} 9$

So $x=42$ is a solution

Ex Try it!

Solve $\sqrt{3x-2}=5$

Bonus:

$\sqrt{-10x-1}+3x=0$

Hint: You will get a quadratic equation

Solve

$\sqrt{4-x}=x-2$

$(x-2)^2 \neq x^2+4$

$(x-2)^2 = (x-2)(x-2)$

FOIL

First Outer Inner Last

$(\sqrt{4-x})^2 = (x-2)^2$ FOIL

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

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

$-4+x \qquad -4+x$

$0 = x^2-4x+x$

$0 = x^2-3x$

$0 = x(x-3)$

$\boxed{x=0}$ or $\boxed{x-3=0 \quad x=3}$

Check in original: $x=3$ works!
but $x=0$
doesn't!

So $x=3$ only solutions.