Lesson 3.3: Radical Equations

Practice Solutions – IV

1. Solve the following radical equations. Be sure to indicate the restrictions on the variable, and verify the solution(s).

a. $\sqrt{3x} = 2$

$x \geq 0, x \in \mathrm{R}$

$$\sqrt{3x} = 2$$
$$(\sqrt{3x})^2 = 2^2$$
$$3x = 4$$
$$x = \frac{4}{3}$$

Verify.

Left Side	Right Side
$\sqrt{3x}$ $\sqrt{3\left(\frac{4}{3}\right)}$ $\sqrt{4}$ 2	2
LS = RS	

b. $\sqrt[3]{x+16} = 9$

$x \in \mathrm{R}$

$$\sqrt[3]{x+16} = 9$$
$$(\sqrt[3]{x+16})^3 = 9^3$$
$$x + 16 = 729$$
$$x = 713$$

Verify.

Left Side	Right Side
$\sqrt[3]{x+16}$ $\sqrt[3]{713+16}$ $\sqrt[3]{729}$ 9	9
LS = RS	

2. Solve the radical equation $\sqrt{5b-1} + 4 = 2b$. Be sure to indicate the restrictions on the variable, and verify the solution(s).

$$5b - 1 \geq 0$$
$$5b \geq 1$$
$$b \geq \frac{1}{5}$$

$$\sqrt{5b-1}+4=2b$$
$$\sqrt{5b-1}=2b-4$$
$$(\sqrt{5b-1})^2=(2b-4)^2$$
$$5b-1=4b^2-16b+16$$
$$0=4b^2-21b+17$$
$$0=(4b-17)(b-1)$$
$$b=\frac{17}{4} \text{ and } b=1$$

Verify:

$b=\frac{17}{4}$

Left Side	Right Side
$\sqrt{5b-1}+4$	$2b$
$\sqrt{5(\frac{17}{4})-1}+4$	$2(\frac{17}{4})$
$\sqrt{\frac{85}{4}-1}+4$	$\frac{34}{4}$
$\sqrt{\frac{81}{4}}+4$	$\frac{17}{2}$
$\frac{9}{2}+4$	
$\frac{17}{2}$	
LS = RS	

$b=1$

Left Side	Right Side
$\sqrt{5b-1}+4$	$2b$
$\sqrt{5(1)-1}+4$	$2(1)$
$\sqrt{5-1}+4$	2
$\sqrt{4}+4$	
$2+4$	
6	
LS ≠ RS	

$b=1$ is an extraneous root.

The solution to the equation is $b=\frac{17}{4}$.

3. Solve the radical equation $\sqrt{2x-3}+2=\sqrt{6x-5}$, $x \geq \frac{3}{2}$. Show all work, and verify the solution(s).

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

$$(2\sqrt{2x-3})^2=(2x-3)^2$$
$$4(2x-3)=4x^2-12x+9$$
$$8x-12=4x^2-12x+9$$
$$0=4x^2-20x+21$$
$$0=(2x-7)(2x-3)$$
$$x=\frac{7}{2} \text{ and } x=\frac{3}{2}$$

Verify:

$x=\frac{7}{2}$

Left Side	Right Side
$\sqrt{2x-3}+2$	$\sqrt{6x-5}$
$\sqrt{2\left(\frac{7}{2}\right)-3}+2$	$\sqrt{6\left(\frac{7}{2}\right)-5}$
$\sqrt{7-3}+2$	$\sqrt{21-5}$
$\sqrt{4}+2$	$\sqrt{16}$
$2+2$	4
4	
LS = RS	

$x=\frac{3}{2}$

Left Side	Right Side
$\sqrt{2x-3}+2$	$\sqrt{6x-5}$
$\sqrt{2\left(\frac{3}{2}\right)-3}+2$	$\sqrt{6\left(\frac{3}{2}\right)-5}$
$\sqrt{3-3}+2$	$\sqrt{9-5}$
$\sqrt{0}+2$	$\sqrt{4}$
2	2
LS = RS	

This equation has two solutions, $x=\frac{7}{2}$ and $x=\frac{3}{2}$.

Please return to *Unit 3: Radicals Lesson 3.3* to continue your exploration.