Good Afternoon!

Please put up your phones, take your seats, and have out your tsunami city homework.

Radical Functions & Equations

A2.AREI.2* Solve simple rational and radical equations in one variable and understand how extraneous solutions may arise.

What is a radical equation?

Examples of Radical Equations	Non-Examples of Radical Equations
$\sqrt{x} + 5 = 11$	$\sqrt{5} + x^2 = 11$
$\sqrt[3]{x-4} = 7$	$x - 4 = \sqrt[4]{16}$
$4\sqrt{x-7} + 12 = 28$	$x\sqrt{10-7} + 12 = 28$
$\sqrt[5]{x} = 225$	$x^4 = \sqrt[3]{27}$

Definitions

Radical Equation: an equation where the variable is found underneath a square root, cube root, or higher root



Radicand: the number or expression under a radical symbol

Radicals

$$(\sqrt{x})^{2} = (6)^{2}$$
 $\sqrt{36} = 6\sqrt{(5x)^{2}} = (-6)^{2}$
 $x = 36$
 $x = 36$

Example 1

$$\sqrt{x} + 5 = 11$$
 $-5 - 5$
 $(\sqrt{x})^{2} - (6)^{2}$
 $\times = 36$

$$\sqrt{36} + 5 = 11$$
 $6 + 5 = 11$
 $11 = 11$

$$\sqrt{x} - 4 = 7$$

$$\sqrt{x} - 4 = 7$$
 $+4$
 $(\sqrt{x})^2 = (11)^2$
 $(11)^2$
 $(11)^2$

$$\sqrt{121} - 4 = 7$$
 $11 - 4 = 7$
 $7 = 7$

Example 2: What's the difference?

$$(\sqrt{x-4})^{2} = (7)^{2}$$

$$\times -4 = 49$$

$$+4 + 4$$

$$\times = 53$$

$$\sqrt{53-4} = 7$$

$$\sqrt{49} = 7$$

$$7 = 7$$

$$\sqrt{x+6} = 15$$

$$(\sqrt{x+6})^{2} = (15)^{2}$$

 $\times + 6 = 225$
 -6
 $\times = 219$

$$\sqrt{219+6} = 15$$
 $\sqrt{225} = 15$
 $15 = 15$

Example 3

$$4\sqrt{x-7} + 12 = 28$$

$$-12 - 12$$

$$4\sqrt{x-7} = \frac{16}{4}$$

$$(\sqrt{x-7}) = (4)^{2}$$

$$x-7 = \frac{16}{4}$$

$$x-7 = \frac{16}{4}$$

$$4\sqrt{16} + 12 = 28$$

 $4(4) + 12 = 28$
 $16 + 12 = 28$
 $28 = 28$

$$5\sqrt{x+3} - 10 = 15$$

$$5\sqrt{x+3} - 10 = 15$$

$$+(0) + 10$$

$$5\sqrt{x+3} = 25$$

$$(5)^{2}$$

$$x+3=25$$

$$-3 - 3$$

$$x=22$$

$$5\sqrt{22+3} - 10 = 15\sqrt{5}$$
 $5\sqrt{25} - 10 = 15$
 $5(5) - 10 = 15$
 $25 - 10 = 15$
 $15 = 15\sqrt{5}$

Proof 1 with Partner

Steps	Reasons
$\sqrt{2x-1} + 5 = 8$	Given Equation

What if our equation was...?

$$\sqrt{x} = -5$$
 $\sqrt{x+5} = -8$

Example 4

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

$$1 \times -3 = 2 \times +4$$

$$-2 \times 2 \times$$

$$-1 \times -3 = 4$$

$$+3 +3$$

$$-1 \times -3 = 7$$

$$\times = -7$$

$$\sqrt{-7-3} = \sqrt{2(-7)} + 4$$

$$\sqrt{-10} = \sqrt{-14+41}$$

$$\sqrt{-10} = \sqrt{-10}$$

Example 5

$$(\sqrt{x-12}) = (2-\sqrt{x})^2$$

$$2 - \sqrt{x}$$

$$2 - \sqrt{x}$$

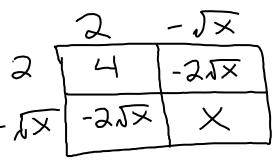
$$-2\sqrt{x}$$

$$-2\sqrt{x}$$

$$x - 12 = 4 - 2\sqrt{x} - 2\sqrt{x} + x$$

$$\frac{2}{2} = 4 - 4\sqrt{2} + \frac{1}{2} = 4 - 4\sqrt{2} + \frac{1}{2} = 4 - 4\sqrt{2} + \frac{1}{2} = 4 - 4\sqrt{2} = 4 + 2 = 4 +$$

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



$$X = 16$$
 $\sqrt{16 - 12} = 2 - \sqrt{16}$
 $2 = -2$

$$\sqrt{x-8} = 4 - \sqrt{x}$$

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

$$(\sqrt{x-8})^{2} = (4-\sqrt{x})^{2}$$

$$2 = 16 = 16 = 10$$

-8=16-82×
-24 = -8NX
$(3=0\times)^2$
9=X

	4	$-\sqrt{\times}$
4	16	-41×
- 17	-4~×	\setminus ×

$$\sqrt{9-8} = 4-\sqrt{9}$$

$$\sqrt{1} = 4-3$$

$$1 = 1$$

Cube root!

$$(3) \times (3)^{3} = (3)^{3}$$

 $\times = 27$