7.6 Notes
Solving Radical Equations

Jedi create light, but the Sith do not create darkness. They merely use the darkness that is always there.

Solving Radical Equations.

we do treat these in the same way we did before
- undo order of operations

when it comes to undoing exponents, our goal is $x^1 =$ ___
we need to be careful... by introducing a power, we possibly introduce false solutions.
Check: Make sure that our solution does not give even root of a negative
: Because even roots give positive values, make sure even root does not equal a neg #

Example 1

a) $\sqrt[3]{x} - 4 = 0$

AS: +4
MD: ÷
E: ^3

$\sqrt[3]{x} = 4$

$(\sqrt[3]{x})^3 = (4)^3$

$(x^{1/3})^3 = 64$

$x^1 = 64$

check
$\sqrt[3]{64} - 4 \stackrel{?}{=} 0$
$4 - 4 = 0$ ✓

b) $12 - \sqrt[4]{x} = 10$

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

$\sqrt[4]{x} = 2$

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

$x = 16$

$12 - \sqrt[4]{16} \stackrel{?}{=} 10$

$12 - 2 = 10$ ✓

Example 2

a) $\sqrt{4x-7} + 2 = 5$

$\sqrt{4x-7} = 3$

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

$4x - 7 = 9$

$4x = 16$

$x = 4$

$\sqrt{16-7} + 2 \stackrel{?}{=} 5$ ✓

b) $\sqrt[3]{x+40} + 5 = 0$

$\sqrt[3]{x+40} = -5$

$(\sqrt[3]{x+40})^3 = (-5)^3$

$x + 40 = -125$

$x = -165$

$\sqrt[3]{-165+40} + 5 \stackrel{?}{=} 0$

$\sqrt[3]{-125} + 5 \stackrel{?}{=} 0$

c) $\sqrt{2x+4} + 8 = 0$

$\sqrt{2x+4} = -8$ ★

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

$2x + 4 = 64$

$2x = 60$

$x = 30$

$\sqrt{60+4} + 8 \stackrel{?}{=} 0$ ✗

no real solution

Example 3

a) $2x^{\frac{3}{2}} = 250$

$x^{3/2} = 125$

$[x^{3/2}]^{2/3} = [125]^{2/3}$

3/2 x 2/3

$x^1 = 125^{2/3}$

$x = 25$

$2(25)^{3/2} = 250$ ✓

b) $3(x-4)^{\frac{4}{3}} = 243$

$(x-4)^{4/3} = 81$

$[(x-4)^{4/3}]^{3/4} = [81]^{3/4}$ ★ we just introduced an even root

$(x-4) = \pm 81^{3/4}$

$x - 4 = \pm 27$

$x = 4 \pm 27$

$x = -23 \quad x = 31$

$3(-27)^{4/3} = 243$ ✓ $\quad 3(27)^{4/3} = 243$ ✓

c) $-3(x-3)^{\frac{5}{2}} = -96$

$-3(x-3)^{5/2} = -96$

$(x-3)^{5/2} = 32$

$x - 3 = 32^{2/5}$

$x - 3 = 4$

$x = 7$

even root neg ✗

even root = neg ✗

Example 4 If we have multiple radicals, isolate the radicals (separate sides of =)

a) $\sqrt{3x+2}-3\sqrt{x}=0$

$\sqrt{3x+2} = 3\sqrt{x}$

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

$3x+2 = 9x$

$2 = 6x$

$\frac{1}{3} = x$

even root of neg? X

even root = neg X

b) $\sqrt[4]{6x-5}-2\sqrt[4]{x+10}=0$

$\sqrt[4]{6x-5} = 2\sqrt[4]{x+10}$

$(\sqrt[4]{6x-5})^4 = (2\sqrt[4]{x+10})^4$

$6x-5 = 16(x+10)$ *

$6x-5 = 16x+160$

$-165 = 10x$

$-16.5 = x$

No real solution b/c $\sqrt[4]{\text{neg}}$

Example 5 radical by itself... we might have to foil if there is more than one term
factor at the end

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

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

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

$x^2-8x+16 = 2x$

$x^2-10x+16 = 0$

$(x-8)(x-2) = 0$

$x=8$ $x=2$

$8-4=\sqrt{16}$ ✓

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

$-2=\sqrt{4}$

b) $x+2=\sqrt{2x+28}$

$(x+2)^2 = (\sqrt{2x+28})^2$

$x^2+4x+4 = 2x+28$

$x^2+2x-24 = 0$

$(x+6)(x-4) = 0$

$x=-6$ $x=4$

$-6+2 \neq \sqrt{12+28}$

$4+2 = \sqrt{8+28}$ ✓