11/7/12 - Sec 9.3 cont.

Math 1010

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#9 $1 - \frac{3}{x} - \frac{28}{x^2} = 0$ $\cdot x^2$

LCD: x^2

D: $x \neq 0$

$x^2 - 3x - 28 = 0$

$(x-7)(x+4)$

$-28 \mid -3$

$-7, 4 \mid -3$

$x - 7 = 0$ $\quad x + 4 = 0$

$+7 \quad +7$ $\quad -4 \quad -4$

$x = 7, \; x = -4$

#41 $(3x)^2 = \left(\sqrt{16 - 10x}\right)^2$

$9x^2 = 16 - 10x$

$+10x \quad -16 \quad +10x$

$9x^2 + 10x - 16 = 0$

$(x+2)(9x-8) = 0$

$-144 \mid 10$

$-18, 8 \mid -10$

$18, -8 \mid 10$

$x + 2 = 0$ $\quad 9x - 8 = 0$

$9x = 8$

$x = 8/9$

$\frac{18}{9}, \frac{-8}{9}$

$2, -8/9$

Radical Eq

1. Make sure Radical is alone on one side of Eq
2. Raise to an appropriate power to clear the Radical
3. Solve the Resulting Eq
4. Check Each Solution in the Original Eq

$3x = \sqrt{16 - 10x}$

$x = 8/9$

$3\left(\frac{8}{9}\right) = \sqrt{16 - 10\left(\frac{8}{9}\right)}$

$\frac{8}{3} = \sqrt{16 - \frac{80}{9}}$

$\frac{8}{3} = \sqrt{\frac{64}{9}}$

$\frac{8}{3} = \frac{8}{3}$ ✓

$x = -2$

$3(-2) = \sqrt{16 - 10(-2)}$

$-6 = \sqrt{16 + 20}$

$-6 = \sqrt{36}$

$-6 \neq 6$

Quadratic in Form (aka Quadratic type)

#50 $x^4 - 37x^2 + 36 = 0$

$(x^2)^2 - 37x^2 + 36 = 0$

$u = x^2$

$u^2 = (x^2)^2 = x^4$

$u^2 - 37u + 36 = 0$

$(u - 36)(u - 1) = 0$

$u - 36 = 0 \qquad u - 1 = 0$

$u = 36 \qquad u = 1$

$\sqrt{x^2} = \sqrt{36} \qquad \sqrt{x^2} = \sqrt{1}$

$x = \pm 6 \qquad x = \pm 1$

Quadratic in type
How to Solve

1st Define a temporary Variable u

2nd Solve the Quad from Step 1

3rd Replace u with the Expression it Represents

4th Solve for the original Variable

5th Check

#56 $(x-4)^2 + (x-4) - 20 = 0$

$u = (x-4)$

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

$u^2 + u - 20 = 0$

$(u-4)(u+5) = 0$

$u-4=0 \quad u+5=0$

$u = 4 \quad u = -5$

$x-4=4 \quad x-4=-5$

$+4 \; +4 \quad +4 \; +4$

$x = 8 \quad x = -1$

#62 $3x^{2/3} - x^{1/3} - 24 = 0$

$3u^2 - u - 24 = 0$ $\quad u = x^{1/3}$

$u^2 = x^{2/3}$

$(u-3)(3u+8)$ $\quad -72 \mid -1$, $-9, 8 \mid -1$

$-\frac{9}{3}, \frac{8}{3}$

$(x^{1/3})^2$

$u - 3 = 0 \quad 3u + 8 = 0$

$u = 3 \quad u = -8/3$

$\pm$ constant $\rightarrow -\frac{3}{1}, \frac{8}{3}$

coefficients of variable

$x^{1/3} = 3 \quad \left(x^{1/3}\right)^3 = \left(\frac{8}{3}\right)^3$

$\frac{2}{1} \cdot \frac{1}{3} = \frac{2}{3}$ ✓

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

$\boxed{x = 27, \frac{-512}{27}}$

Problem #1

$\sqrt{(x-3)^2} = \sqrt{25} \quad x = 8, -2$

$x - 3 = \pm 5$

$+3 \quad +3$

$x = 3 \pm 5$

$x = 3 + 5, \; 3 - 5$

$8, -2$

Problem # 2

$2r^2 - 4r + 1 = 0$

$a = 2 \quad b = -4 \quad c = 1$

$$r = \frac{4 \pm \sqrt{16 - 4(2)(1)}}{2(2)}$$

$$= \frac{4 \pm \sqrt{8}}{4}$$

$$= \frac{4 \pm 2\sqrt{2}}{4}$$

$$= \frac{2(2 \pm \sqrt{2})}{4\,2} =$$

$$\frac{2 \pm \sqrt{2}}{2}$$

Problem # 3

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

$$x^2 \cdot 3 = 2 - x$$

$$3x^2 = 2 - x$$

$$+x \quad -2 \quad +x$$

$$3x^2 + x - 2 = 0$$

$$(x+1)(3x-2) = 0$$

$3x^2 + -2x + 3x - 2 = 3x^2 + x - 2$ ✓

$x + 1 = 0 \quad , \quad 3x - 2 = 0$

$-1 \quad -1 \qquad +2 \quad +2$

$3x = 2$

$x = -1, \ 2/3$

$x = -\cancel{x}, \ \boxed{2/3}$

Check

$x = -1$

$-1\sqrt{3} = \sqrt{2-(-1)}$

$-\sqrt{3} \neq \sqrt{3}$

$x = 2/3$ ✓

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

$\frac{2\sqrt{3}}{3} = \sqrt{\frac{4}{3}} = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$

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