COLLEGE ALGEBRA **MATH 161** **THOMPSON**

Section 1.4 PART 2 **Equations of Quadratic Type**

USE U SUBSTITUTION FOR X

1) $x^4 - 10x^2 + 9 = 0$ factor and take half of 1st exponent

$u = x^2$ $u^4 - 10u^2 + 9 = 0$

$(u^2-9)(u^2-1)=0$

$(u+3)(u-3)(u-1)(u+1)=0$ PUT X BACK IN FOR U

$x = -3,-1,1,3$

2) $8x^4 - 2x^2 - 1 = 0$ SLIDE AND DIVIDE and take half of 1st exponent

$u = x^2$ $8u^2 - 2u - 1 = 0$

$u^2 - 2u - 8 = 0$

$(u-4)(u+2)=0$ *divide by 8*

$u = \frac{1}{2}, -\frac{1}{4}$ *can't take square root of a negative number*

$x^2 = \frac{1}{2}$ $\cancel{x^2 = -\frac{1}{4}}$ PUT X BACK IN FOR U

$x = \sqrt{\frac{1}{2}} \rightarrow \sqrt{\frac{1}{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = \pm\frac{\sqrt{2}}{2}$

3) $x^6 - 26x^3 - 27 = 0$ $u=x^3$ $u^6-26u-27=0$ take half of 1st exponent

$(u^3-27)(u^3+1)=0$ set both equal to zero

$u = -1,27$ PUT X BACK IN FOR U

$x^3 = -1$ $x^3 = 27$

$x = -1,3$

4) $(x+2)^2 + 9(x+2) + 14 = 0$ u is always the middle term

u= x+2 $u^2+9u+14=0$

$(u+7)(u+2)=0$

u = -7,-2 PUT X BACK IN FOR U

x+2 = -7 and x + 2 = -2

x = -9, -4

5) $(2x+4)^2 + 4(2x+4) + 4 = 0$ u is always the middle term

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

*if nothing is in front of the middle term just use u $(u+2)(u+2)=0$

u = -2

2x+4 = -2

x = -3

6) $2(s+7)^2 - 13(s+7) = 7$ u= s+7 $2u^2-13u-7=0$

$u^2-13u-14=0$

$(u-14)(u+1)=0$

u = $\frac{14}{2}$ may convert to 7, $\frac{-1}{2}$

s+7 = 7 and s+7 = $\frac{-1}{2}$

x = 0, $-7\frac{1}{2}$

7) $x - 12x\sqrt{x} = 0$ move one term to the right

$(x = 12x\sqrt{x})^2$ square both sides

$x^2 = 144x^3$ move back to left to factor

$x^2 - 144x^3 = 0$

$x^2(1-144x) = 0$ set each part equal to zero

$x^2 = 0$ and $1 - 144x = 0$

x = 0, $\frac{1}{144}$

8) $x + \sqrt{x} = 72$

$u=\sqrt{x}$ $u^2+u-72=0$

$(u-8)(u+9)=0$ $u = -9,8$

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

no solution $x = 64$

9) $4x^{1/2} - 9x^{1/4} + 3 = 0$

$u=x^{1/4}$ $4u^2-9u+3=0$ *Use quadratic equation because it doesn't factor*

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a} \qquad \frac{9 \pm \sqrt{81-4\cdot4\cdot3}}{8} \qquad u = \frac{9 \pm \sqrt{33}}{8}$$

The opposite of ¼ root is raised to the 4th power, put answer in exactly like this

$$x = \left(\frac{9+\sqrt{33}}{8}^4\right), \left(\frac{9-\sqrt{33}}{8}^4\right)$$

10) $\left(\sqrt[4]{7x^2-6} = x\right)^4$ raise both sides to the 4th power

$7x^2-6 = x^4$ move everything to the right side0

$x^4-7x^2-6=0$ FACTOR, half of 1st exponent

$(x^2-6)(x^2-1)=0$ set both sides equal to zero

$x^2-6=0$ and $x^2-1=0$ take square root of both

$x = \sqrt{6}, 1$

** if $x = \sqrt{8}$ must reduce radical*

$\sqrt{2 \cdot 4} \rightarrow x = 2\sqrt{2}$

11) $x^2 + 8x + 3\sqrt{x^2+8x} = 18$ $u=\sqrt{x^2+8x}$ $u^2+3u-18=0$

$(u-3)(u+6)=0$ $u = -6,3$

$\sqrt{x^2+8x} = -6$ $\sqrt{x^2+8x} = 3$

can't have negative $x^2+8x=9$ move 9 to left to factor

$x^2+8x-9=0$ FACTOR

$(x+9)(x-1)=0$ set both sides equal to zero

$x = -9,1$

12) $x^{-2} - 6x^{-1} + 8 = 0$ $u=x^{-1}$ $u^2-6u+8=0$

$(u-2)(u-4)=0$ $u = 2,4$

$x^{-1} = 2$ $x^{-1} = 4$ negative exponent makes answer a fraction

$x = ½, ¼$

13) $5x^{2/3} - 34x^{1/3} - 7 = 0$ $u=x^{1/3}$ $5u^2-34u-7=0$ USE SLIDE AND DIVIDE

$u^2-34u-35=0$

$(u-35)(u+1)=0$ divide by 5

$u = 7, -1/5$

$x^{1/3} = 7$ $x^{1/3} = -1/5$

opposite of 1/3 exponent is cube so cube both answers

$x = 343, -\frac{1}{125}$

14) $\left(\frac{v}{v+1}\right)^2 + \frac{3v}{v+1} = 18$ $u=\frac{v}{v+1}$ the 3 is the coefficient in front of u

$u^2+3u-18=0$

$(u+6)(u-3)=0$ $u = -6,3$

$\frac{v}{v+1} = -6$ $\frac{v}{v+1} = 3$

$-6v-6=v$ $3v+3=v$

$-6 = -7v$ $3 = -2v$

$x = -\frac{6}{7}$ and $-\frac{3}{2}$