

**Homework: Solving Polynomial Equations**

**Directions:** Solve each equation by factoring. Simplify all irrational and complex solutions.

1.)  $12x^3 - 3x = 0$   
 $3x(4x^2 - 1) = 0$   
 $3x(2x+1)(2x-1) = 0$   
 $3x=0, 2x+1=0, 2x-1=0$   
 $X=0$     $X=-1/2$     $X=1/2$

2.)  $x^4 - 81 = 0$   
 $(x^2+9)(x^2-9) = 0$   
 $(x^2+9)(x+3)(x-3) = 0$   
 $x^2+9=0, x+3=0, x-3=0$   
 $\sqrt{x^2+9}$     $X=-3$     $X=3$   
 $X = \pm 3i$

3.)  $x^3 - 64 = 0$   
 $(x-4)(x^2+4x+16) = 0$   
 $x-4=0$     $x^2+4x+16=0$   
 $X=4$     $-4 \pm \sqrt{(4)^2 - 4(1)(16)}$   
 $\frac{-4 \pm \sqrt{-48}}{2} \Rightarrow \frac{-4 \pm 4i\sqrt{3}}{2} \Rightarrow X = -2 \pm 2i\sqrt{3}$

4.)  $13x^3 + 12 = 4 - 14x^3$   
 $+14x^3 - 4 + 14x^3$   
 $27x^3 + 8 = 0$   
 $(3x+2)(9x^2-6x+4) = 0$   
 $3x+2=0$     $9x^2-6x+4=0$   
 $X = -2/3$     $6 \pm \sqrt{(6)^2 - 4(9)(4)}$   
 $\frac{6 \pm \sqrt{-108}}{18} \Rightarrow \frac{6 \pm 6i\sqrt{3}}{18} \Rightarrow X = \frac{1 \pm i\sqrt{3}}{3}$

5.)  $2x^3 - 16x^2 - 40x = 0$   
 $2x(x^2 - 8x - 20) = 0$   
 $2x(x-10)(x+2) = 0$   
 $2x=0, x-10=0, x+2=0$   
 $X=0$     $X=10$     $X=-2$

6.)  $x^4 + 4x^2 = 9x^2 + 36$   
 $-36 - 9x^2 - 9x^2 - 36$   
 $x^4 - 5x^2 - 36 = 0$   
 $(x^2-9)(x^2+4) = 0$   
 $(x+3)(x-3)(x^2+4) = 0$   
 $x+3=0, x-3=0, x^2+4=0$   
 $X=-3$     $X=3$     $X = \pm 2i$

7.)  $x^3 + 3x^2 = 16x + 48$   
 $-16x - 48$   
 $(x^3 + 3x^2 - 16x - 48) = 0$   
 $x^2(x+3) - 16(x+3) = 0$   
 $(x^2-16)(x+3) = 0$   
 $(x+4)(x-4)(x+3) = 0$   
 $x+4=0, x-4=0, x+3=0$   
 $X=-4$     $X=4$     $X=-3$

8.)  $(2x^3 - x^2 - 98x + 49) = 0$   
 $x^2(2x-1) - 49(2x-1) = 0$   
 $(x^2-49)(2x-1) = 0$   
 $(x+7)(x-7)(2x-1) = 0$   
 $x+7=0, x-7=0, 2x-1=0$   
 $X=-7$     $X=7$     $X=1/2$