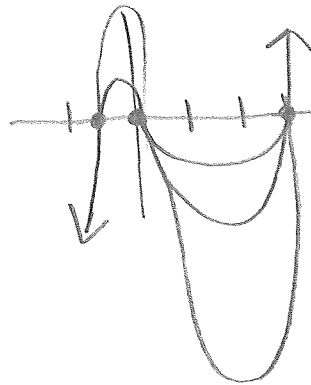


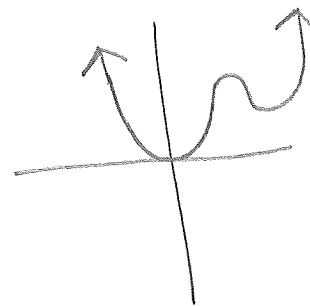
Take note		Concept Summary Polynomial Factoring Techniques	
Techniques		Examples	
<b>Factoring out the GCF</b> Factor out the greatest common factor of all the terms.		$15x^4 - 20x^3 - 35x^2$ $= 5x^2(3x^2 - 4x + 7)$	
<b>Quadratic Trinomials</b> For $ax^2 + bx + c$ , find factors with product $ac$ and sum $b$ .		$6x^2 + 11x - 10$ $= (3x - 2)(2x + 5)$	
<b>Perfect Square Trinomials</b> $a^2 \pm 2ab \pm b^2 = (a \pm b)^2$ $a^2 - 2ab \pm b^2 = (a - b)^2$		$x^2 + 10x + 25 = (x + 5)^2$ $x^2 - 10x + 25 = (x - 5)^2$	
<b>Difference of Squares</b> $a^2 - b^2 = (a + b)(a - b)$		$4x^2 - 15 = (2x + \sqrt{15})(2x - \sqrt{15})$	
<b>Factoring by Grouping</b> $ax + ay + bx + by$ $= a(x + y) + b(x + y)$ $= (a + b)(x + y)$		$x^3 + 2x^2 - 3x - 6$ $= x^2(x + 2) + (-3)(x + 2)$ $= (x^2 - 3)(x + 2)$	
<b>Sum or Difference of Cubes</b> $a^3 \pm b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$		$8x^3 + 1 = (2x + 1)(4x^2 - 2x + 1)$ $8x^3 - 1 = (2x - 1)(4x^2 + 2x + 1)$	

**Examples** – Solve the equations for the real or imaginary solutions of each polynomial equation.

1.  $2x^3 - 5x^2 = 3x$   
 $2x^3 - 5x^2 - 3x = 0$   
 $x(2x^2 - 5x - 3) = 0$   
 $x(2x + 1)(x - 3) = 0$   
 $\downarrow \quad \downarrow \quad \downarrow$   
 $x = 0 \quad x = -1/2 \quad x = 3$



2.  $3x^4 + 12x^2 = 6x^3$   
 $3x^4 - 6x^3 + 12x^2 = 0$   
 $3x^2(x^2 - 2x + 4) = 0$   
 $3x \cdot x \cdot (x - 2)(x - 2) = 0$   
 $\downarrow \quad \downarrow$   
 $x = 0$   
 $x^2 - 2x + 4 = 0$   
 $x^2 - 2x + 1 = -4 + 1$   
 $\sqrt{(x - 1)^2} = \sqrt{-3}$   
 $x - 1 = \pm \sqrt{3}i$   
 $x = 1 \pm \sqrt{3}i$



$$3. \quad x^4 - 3x^2 = 4$$

$$x^4 - 3x^2 - 4 = 0$$

$$(x^2 - 4)(x^2 + 1) = 0$$

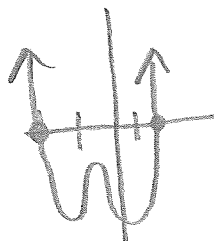
$$x^2 - 4 = 0 \quad x^2 + 1 = 0$$

$$(x-2)(x+2) = 0 \quad \sqrt{x^2} = \sqrt{-1}$$

$$x = 2 \quad x = -2 \quad x = \pm i$$

$$\sqrt{x^2} = \sqrt{4}$$

$$x = \pm 2$$



$$4. \quad 125x^3 = 27$$

$$125x^3 - 27 = 0$$

$$(5x - 3)(25x^2 + 15x + 9) = 0$$

$$x = 3/5$$

$$-b \pm \sqrt{b^2 - 4ac}$$

$$\frac{-15 \pm \sqrt{225 - 4(25)(9)}}{2a}$$

$$\frac{-15 \pm \sqrt{225 - 900}}{50}$$

$$\frac{-15 \pm \sqrt{-675}}{50}$$

$$\frac{-15 \pm \sqrt{675}i}{50}$$

$$\frac{3}{50} \pm \frac{3}{10}\sqrt{3}i$$

$$-3 \pm 3\sqrt{3}i$$

$$675$$

$$5 \overline{) 135}$$

$$5 \overline{) 27}$$

$$3 \overline{) 33}$$

$$5. \quad x^3 + 4x = 3x^2 + 12$$

$$x^3 - 3x^2 + 4x - 12 = 0$$

$$x^2(x-3) + 4(x-3) = 0$$

$$(x-3)(x^2+4) = 0$$

$$x = 3$$

$$x^2 + 4 = 0$$

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

$$x = \pm 2i$$

**To solve polynomial equations:**

**1. Write in standard form if necessary. (set equal to zero)**

**2. Factor completely. (look for GCF)**

**3. Use the zero-product property and set each factor equal to zero.**

**4. If a quadratic polynomial can not be factored use the quadratic formula.**  $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

**5. Remember to simplify all radicals.**

Find the real or imaginary solutions of each equation by factoring.

1.  $x^3 + 64 = 0$

2.  $3x^3 + 3x = 2 + 2x^2$

3.  $2x^3 - 250 = 0$

4.  $3x^4 + 36x^2 = 24x^3$

5.  $x^4 - 12x^2 + 11 = 0$

6.  $x^4 - 81 = 0$

7.  $x^4 - 5x^2 - 36 = 0$

8.  $x^4 + 3x^2 - 4 = 0$

9.  $4x^3 + 2x^2 - 20x = 0$

10.  $8x^2 - 13x^2 = 6x$

11.  $x^4 - x = 0$

12.  $x^4 - 10x^2 + 16 = 0$

13.  $x^4 = 25$

14.  $27x^3 + 1 = 0$

15.  $2x^3 + 7x^2 - 21 = 6x$

16.  $2x^3 + 54 = 0$