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## 6.5 Solving by Factoring Notes

*Warm-up*  
rationalizing  
Denominator

$$\frac{3\sqrt{2}}{\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}} = \frac{3\sqrt{2}\sqrt{5}}{\sqrt{25}} \Rightarrow \frac{3\sqrt{10}}{5}$$

Factor the following quadratic, write the x-intercepts, and state the zeros.  
 $x^2 + 7x - 30 = 0$

$$(x + 10)(x - 3) = 0$$

$$x + 10 = 0 \quad x - 3 = 0$$

$$x = -10 \quad x = 3$$

X-intercepts  $(-10, 0)$   $(3, 0)$   
 Zeros/roots  $-10, 3$

Solving  
Polynomials  
by  
Factoring

- Write the polynomial in standard form and set equal to 0.
  - Factor the polynomial completely!
  - Use zero product property. Set each factor equal to zero and solve.
- A **Quadratic** equation can be solved by
- factoring
  - Taking the square root (no x-term)
  - quadratic formula
  - completing the square

Directions: Solve each polynomial by factoring. Always check GCF!

1.  $0 = x^3 + x$  ①

$$0 = x(x^2 + 1)$$
 ②
$$x = 0 \quad x^2 + 1 = 0$$

$$x^2 = -1$$

$$x = \pm \sqrt{-1}$$

$$x = \pm i$$

$x = 0, -i, i$

2.  $4x^3 - 7x^2 = 3x^2$

$$4x^3 - 7x^2 - 3x^2 = 0$$

$$4x^3 - 10x^2 = 0$$
 ①
$$2x^2(2x - 5) = 0$$

$$2x^2 = 0 \quad 2x - 5 = 0$$

$$x = 0 \quad 2x = 5$$

$$x = \frac{5}{2}$$

$x = 0, \frac{5}{2}$

$\sqrt{-1} = i$  lesson 4.3

3.  $5x^5 - 80x = 0$

$5x(x^4 - 16) = 0$

$5x(x^2 - 4)(x^2 + 4) = 0$

$5x(x-2)(x+2)(x^2+4) = 0$

$5x = 0 \quad (x-2) = 0 \quad (x+2) = 0 \quad x^2 + 4 = 0$

$x = 0 \quad x = 2 \quad x = -2 \quad x^2 = -4$   
 $x = \pm 2i$

→ Finding solutions

$x^2 - 4 = 0$

$x^2 = 4$

$x = \pm 2$

$x = 0, \pm 2, \pm 2i$

4.  $3x^4 - 2x^2 = 16$

$3x^4 - 2x^2 - 16 = 0$

~~$-8x^4$~~   $6x^2$   $316$   
 ~~$-2x^2$~~   $6-8$

$3x^4 - 8x^2 + 6x^2 - 16 = 0$

$x^2(3x^2 - 8) + 2(3x^2 - 8) = 0$

$(x^2 + 2)(3x^2 - 8) = 0$

$x^2 + 2 = 0$

$x^2 = -2$

$x = \pm i\sqrt{2}$

$3x^2 - 8 = 0$

$3x^2 = 8$

$x^2 = 8/3$

$x = \pm \sqrt{8/3} = \pm 2\sqrt{2/3}$

5.  $(x^3 + 2x^2) + 5(x + 10) = 0$

$x^2(x+2) + 5(x+2) = 0$

$(x^2 + 5)(x + 2) = 0$

$x^2 + 5 = 0 \quad x + 2 = 0$

$x^2 = -5$

$x = \pm \sqrt{-5}$

$x = -2$

$x = \pm i\sqrt{5}, -2$

6.  $2x^3 - 32x + 48 = 3x^2$

$(2x^3 - 3x^2) - (32x + 48) = 0$

$x^2(2x - 3) - 16(2x - 3) = 0$

$(x^2 - 16)(2x - 3) = 0$

$x^2 - 16 = 0$

$x^2 = 16$

$x = \pm \sqrt{16}$

$x = \pm 4$

$2x - 3 = 0$

$2x = 3$

$x = 3/2$

$x = 3/2, \pm 4$

✓ Rationalize Denominator

$\pm 2 \cdot \frac{\sqrt{2}}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \pm \frac{2\sqrt{6}}{3}$

$x = \pm i\sqrt{2}, \pm \frac{2\sqrt{6}}{3}$