

Chapter 8: Factoring Polynomials

8.5: USING FACTORING TO SOLVE POLYNOMIAL EQUATIONS

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Zero Factor Property

- Z.F.P.
- If the product is zero, at least one of the factors must be zero

Zero Factor Property

- Solve equation by using ZFP
- Be sure it is equal to zero
- Factor it and make new equations for each factor
 - Set value of factor to zero
 - Solve the zero factor equation to find value of variable that will make the factor be zero

$$x^2 + 8x + 15 = (x + 3)(x + 5) = 0$$

- $(x+3)=0$
- Solve for x
 - Subtract 3 from both sides: WRITE THIS STEP
 - $x=-3$
- or
- $(x+5)=0$
- Solve for x
 - Subtract 5 from both sides: WRITE THIS STEP
 - $x=-5$

$$x^2 + 8x + 15 = (x + 3)(x + 5) = 0$$

CHECK BOTH:

- $x = -3$
- $(-3)^2 + 8(-3) + 15 =$
- $9 - 24 + 15 = 0$
- Or
- $x = -5$
- $(-5)^2 + 8(-5) + 15 =$
- $25 - 40 + 15 = 0$
- Write: $x = -3, -5$ this is not an ordered pair

$$4x^2 - 36 = 4(x - 3)(x + 3) = 0$$

- $4 \neq 0$...leave it off the list!!
- $x - 3 = 0$, solve for x , add 3 to both sides
- $x = 3$
- $x + 3 = 0$, solve for x , subtract 3 from both
- $x = -3$
- Check: $4(3)^2 - 36 =$ $4(-3)^2 - 36 =$
- $4(9) - 36 = 36 - 36 = 0$ $4(9) - 36 = 36 - 36 = 0$

$$-5x^2 + 30x - 40 = -5(x-4)(x-2) = 0$$

- $5 \neq 0$...leave it off the list!!
- $x-4=0$, solve for x : subtract 4 from both
- $x=4$
- $x-2=0$, solve for x : add 2 to both sides
- $x=2$
- Check both:
 - $-5(4)^2 + 30(4) - 40 =$ $-5(2)^2 + 30(2) - 40 =$
 - $-5(16) + 120 - 40 =$ $-5(4) + 60 - 40 =$
 - $-80 + 80 = 0$ $-20 + 20 = 0$

$$2x^2 - 8x = 5x - 20$$

- Not equal to zero, so ZFP cannot be used
- Until you MAKE it equal to zero!!
- Move terms by adding or subtracting on both sides
- $2x^2 - 8x - 5x + 20 = 0$
- combine like terms: $2x^2 - 13x + 20 = 0$
- Factor: $(2x - 5)(x - 4) = 0$
- Use ZFP: $2x - 5 = 0$ $x - 4 = 0$
- $2x = 5, x = 5/2$ $x = 4$

$$2x^2 - 8x = 5x - 20$$

- Check $x = 5/2$
- Check $x = 4$

$$2[4]^2 - 8[4] ? = 5[4] - 20$$

$$2[16] - 32 ? = 20 - 20$$

$$32 - 32 = 0$$

$$20 - 20 = 0$$

$$2\left[\frac{5}{2}\right]^2 - 8\left[\frac{5}{2}\right] ? = 5\left[\frac{5}{2}\right] - 20$$

$$2\left[\frac{25}{4}\right] - \frac{40}{2} ? = \frac{25}{2} - \frac{40}{2}$$

$$\frac{25}{2} - \frac{40}{2} = -\frac{15}{2}$$

$$(x+2)(x-4)=7$$

- Need to make it equal zero
- BE CAREFUL!!
- If you subtract 7 from both sides, it does
- $(x+2)(x-4)-7=0$,
- but it is not composed of factors,
- so you cannot use zero factor property
- What could be done?

$$(x+2)(x-4)=7$$

- Use FOIL on left:
- $x^2-2x-8=7$
- Now subtract 7 from both sides
- $x^2-2x-15=0$, and factor
- $(x-5)(x+3)=0$
- $x-5=0$ $x+3=0$
- Add 5 to both subtract 3 from both
- $x=5$ $x=-3$ and check

$$(x+2)(x-4)=7$$

▪ Check $x=5$

▪ $(5+2)(5-4)=$

▪ $7 \cdot 1 = 7 \checkmark$

$$x=-3$$

$$(-3+2)(-3-4)=$$

$$-1 \cdot (-7) = 7 \checkmark$$

$$f(x) = x^2 - 3x - 23, f(5)$$

- Means: put 5 in for x
- $f(5) = (5)^2 - 3(5) - 23$
- $f(5) = 25 - 15 - 23 = -13$

$$f(x) = x^2 - 3x - 23, f(x) = 5$$

- Means $5 = x^2 - 3x - 23$
- Use Zero Factor Property to solve
- Subtract 5 from both sides
- $0 = x^2 - 3x - 28$
- Factor: $(x-7)(x+4) = 0$
- $x-7=0$ $x+4=0$
- $x=7$ $x=-4$