Name: Completed Period: _____

*you can always check by redistributing!

5.5 Day 1 Notes Factoring Polynomials

Factor the following using GCF. **Always look for GCF fist!

1. $12x^3 - 36x^2$

$12x^2(x-3)$

2. $8x^2 - 16x$

$8x(x-2)$

3. $18r^2s^3 - 12r^4s$

$6r^2s(3s^2 - 2r^2)$

Difference of Two Perfect Squares: $a^2 - b^2 = (a+b)(a-b)$

4. $x^2 - 49$

$(x)^2 - (7)^2$ (a, b)

$(a+7)(a-7)$

5. $36x^4 - 25y^6$

$(6x^2)^2 - (5y^3)^2$ (a, b)

$(6x^2+5y^3)(6x^2-5y^3)$

6. $8x^2 - 2$ hint: factor out GCF first!

$2(4x^2-1)$

$(2x)^2 - (1)^2$

$2(2x+1)(2x-1)$

7. $49x^2 + 36$

not a difference

not factorable

Factoring Trinomials:

8. $x^2 - 5x - 24$

mult: -24, add: -5

$-8, 3$

$(x-8)(x+3)$

9. $x^2 - 8x + 15$

$(x-5)(x-5)$

10. $6x^2 + 7x - 5$

mult: -30, add: 7

$10, -3$ ✓

$(6x^2+10x)(-3x-5)$

$2x(3x+5) - 1(3x+5)$

$(2x-1)(3x+5)$

You can use this same process for higher degree ploynomials IF: the degree of the 1st term is twice the degree of the second term.

11. $x^4 + 14x^2 + 48$

mult: 48, add: 14

$6, 8$

$(x^2+6)(x^2+8)$

12. $x^6 + 3x^3 - 40$

mult: -40, add: 3

$8, -5$

$(x^3+8)(x^3-5)$

$(x+2)(x^2-2x+4)(x^3-5)$

13. $3x^4 - 5x^2 - 12$

Factor the same way

mult: -36, add: -5

$-9, 4$ ✓

$(3x^4-9x^2)(+4x^2-12)$

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

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

After each round of factoring double check you're done

Factoring by grouping:

When we have four terms, we factor by grouping. If there are only 4 terms, we group the first 2 terms and the second 2 terms together and factor out the GCF. from each grouping to create the factors.

Ex. $(3x^3 + 12x^2 + x + 4)$

$3x^2(x+4) + 1(x+4)$

$(3x^2+1)(x+4)$

14. $(2x^3 + x^2 + 8x + 4)$

$x^2(2x+1) + 4(2x+1)$

$(x^2+4)(2x+1)$

Ex. $(x^3 + 3x^2 - 4x - 12)$

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

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

$(x+2)(x-2)(x+3)$

15. $(x^3 - 2x^2 - 9x + 18)$

$x^2(x-2) - 9(x-2)$

$(x^2-9)(x-2)$

$(x+3)(x-3)(x-2)$

Sums/Differences of two cubes:

Difference of two cubes: $a^3 - b^3 = (a-b)(a^2+ab+b^2)$ 1st: Identify a and b

Sum of two cubes: $a^3 + b^3 = (a+b)(a^2-ab+b^2)$

Remember the signs! - S O A P

Ex. $x^3 - 8$

$(x)^3 - (2)^3$

$a \quad b$

$(x-2)(x^2+2x+4)$

16. $x^3 + 27$

$(x)^3 + (3)^3$

$a \quad b$

$(x+3)(x^2+3x+9)$

Ex. $3x^4 + 24x$

$3x(x^3+8)$

$(x)^3 + (2)^3$

$3x(x+2)(x^2+2x+4)$

17. $2x^4 - 54x$

$2x(x^3-27)$

$(x)^3 - (3)^3$

$2x(x-3)(x^2+3x+9)$

* Now go back to #12, are you done?

Name: _____ **Period:** _____ **Date:** _____

5.5 Day 2 Notes Factoring Polynomials

Warm-Up: Factor the following

1. $(x^3 + 3x^2)(-4x - 12)$

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

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

$\boxed{(x+2)(x-2)(x+3)}$

2. $6x^4 - 19x^2 + 3$

mult add

18	-19
-18, -1	✓

$(6x^4 - 18x^2)(-1x^2 + 3)$

$6x^2(x^2-3) - 1(x^2-3)$

$\boxed{(6x^2-1)(x^2-3)}$

3. $8t^4 + 1t$

$t(8t^3 + 1)$

$(2t)^3 \quad (1)^3$

$\boxed{t(2t+1)(4t^2-2t+1)}$

Solving Equations with factoring: Remember to solve a polynomial it must be equal to 0 !

Use factoring procedures and the zero product property to solve the higher degree polynomials.

set each factor to 0 + solve

Ex. $x^2 + 6x + 5 = 0$

$(x+5)(x+1) = 0$

$x+5=0 \quad x+1=0$

$\boxed{x=-5 \quad x=-1}$

4. $x^2 - 3x - 10 = 0$

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

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

$\boxed{x=5 \quad x=-2}$

Ex: $x^3 + 2x^2 - 9x = 18$

$(x^3 + 2x^2)(-9x - 18) = 0$

$x^2(x+2) - 9(x+2) = 0$

$(x^2-9)(x+2) = 0$

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

$\quad = 0 \quad = 0 \quad = 0$

$\boxed{x=-3 \quad x=3 \quad x=-2}$

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

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

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

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

$\quad = 0 \quad = 0 \quad = 0$

$\boxed{x=-2 \quad x=2 \quad x=-1}$

*

mult -90
add 1

Ex. $x^4 + x^2 - 90 = 0$ 10, -9

$(x^2+10)(x^2-9)=0$

$(x^2+10)(x+3)(x-3)=0$

$x^2+10=0$ → $x=\pm i\sqrt{10}$ $x=3$ $x=-3$

6. $x^4 - 7x^2 = 44$

mult -44
add -7
-11, 4 ✓

$x^4-7x^2-44=0$

$(x^2-11)(x^2+4)=0$

$x^2-11=0$ $x^2+4=0$

$x^2=11$ $x^2=-4$

$x=\pm\sqrt{11}$ $x=\pm 2i$

Ex. $8x^3 = 1$

$8x^3-1=0$

$(2x)^3-(1)^3$

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

$2x-1=0$ quad formula

$x=1/2$ $x=\frac{-1\pm i\sqrt{3}}{4}$

Extra Practice

$x=\frac{-2\pm\sqrt{(2)^2-4(4)(1)}}{2(4)}$

$x=\frac{-2\pm\sqrt{-12}}{8}$

$x=\frac{-2\pm 2i\sqrt{3}}{8}$

7. $x^3 = -27$

$x^3+27=0$

$(x)^3+(3)^3$

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

$x+3=0$ quad formula

$x=-3$

$x=\frac{3\pm\sqrt{(-3)^2-4(1)(9)}}{2(1)}$

$x=\frac{3\pm\sqrt{-27}}{2}$

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