Factoring GCF – A=1 – A not 1 – Difference of Squares Notes/Homework

Name_____ Date_____

Factor out GCF Greatest Common Factor

Factors 15: 1, 3, 5, 15 35: 1, 5, 7, 35

$15x + 35$

$5\cdot3\cdot x + 5\cdot7$

$5(3x+7)$

common Factor • (leftover factors)

$-5 - 1x$

$-1\cdot5 - 1\cdot x$

$-1(5+x)$

$-1(x+5)$

★ factoring out -1 changes sign

$14 - 7x$

$-7(-2+x)$

$-7(x-2)$

$55p^2 - 11p^4 + 44p^5$

$11\cdot5\cdot p\cdot p - 11\cdot p\cdot p\cdot p\cdot p + 11\cdot4\cdot p\cdot p\cdot p\cdot p\cdot p$

$11p^2(5 - p^2 + 4p^3)$

$11p^2(4p^3 - p^2 + 5)$

$14x^3 - 42x^5 - 49x^4$

$7x^3(2 - 6x^2 - 7x)$

$-7x^3(6x^2 + 7x - 2)$

$30mn^2 + m^2n - 6n$

$n(30m + m^2 - 6)$

$n(m^2 + 30m - 6)$

$3x^2 - 4x = 0$

$x(3x-4)=0$

$x=0$ $3x-4=0$

$3x=4$

$x=\frac{3}{4}$

$27x^3 - 108x = 0$

$27x(x^2-4)=0$

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

$+4\ +4$

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

$x=\pm2$

$x=2$ $x=-2$

when you take √ must be ±

$45s^3 - 18s^2 = 0$

$9s^2(5s-2)=0$

$s^2=0$ $5s-2=0$

$s=\pm0$ $5s=2$

$s=0$ twice $s=\frac{2}{5}$

1) Pair up terms Factor by Grouping

$12ax + 3xz + 4ay + 1yz$

2) Factor out GCF from each pair $3x(4a+1z)+1y(4a+1z)$

3) Factor out common factor again $(4a+z)(3x+y)$

$4m^2 + 4mn + 3mn + 3n^2$

$4m(m+n) + 3n(m+n)$

$(m+n)(4m+3n)$

$14y^3 - 28y^2 + 3y + 6$

$14y^2(1y-2)+3(1y+2)$

Not factorable by grouping

$14y^3 - 28y^2 - 3y + 6$

$14y^2(y-2)-3(y-2)$

$(y-2)(14y^2-3)$

$6y^2 - 4y - 3y + 2 = 0$

$2y(3y-2)-1(3y-2)=0$

$(3y-2)(2y-1)=0$

$3y-2=0$ $2y-1=0$

$+2\ +2$ $+1\ +1$

$\frac{3y}{3}=\frac{2}{3}$ $\frac{2y}{2}=\frac{1}{2}$

$y=\frac{2}{3}$ $y=\frac{1}{2}$

Sometimes you need to factor out 1 or -1

$12a^3 - 3a^2 + 8a = 2$

$-2\ -2$ ★ must = 0 in order to factor

$12a^3 - 3a^2 + 8a - 2 = 0$

$3a^2(4a-1)+2(4a-1)=0$

$(4a-1)(3a^2+2)=0$

$4a-1=0$ $3a^2+2=0$

$4a=1$ $3a^2=-2$

$a=\frac{1}{4}$ $\sqrt{a^2}=\sqrt{-\frac{2}{3}}$

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

$a=0.816i$

$a=-0.816i$

$\sqrt{18}$

$\sqrt{9}\cdot\sqrt{2}$

$3\sqrt{2}$

$\sqrt{-9}$

$\sqrt{9}\cdot\sqrt{-1}$

$3i$

★ Imaginary solutions

★ if there is a negative under the √, take out an i and make underneath positive

ax^2+bx+c

Factoring Trinomial when a = 1

Guess & Check

$x^2 - x - 2$

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

$+1x \quad -1x$

$+ -2x$

X method

$x^2 - 4x + 3$ $\quad b=-4 \quad c=3$

c: 3, -1, -3; b: -4

$(x-1)(x-3)$

Box Method

$c^2 + 7c - 8$

$(c-1)(c+8)$ length • width

	c	$+8$
c	c^2	$8c$
-1	$-1c$	-8

$x^2 + 5x = -6$

$x^2+5x+6=0$ $\quad +6 \quad +6$

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

$x+3=0 \quad x+2=0$

$x=-3 \quad x=-2$

$x^4 + 6 = 5x^2$

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

$x^4-5x^2+6=0$

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

6: -2, -3; b: -5

$x^2-2=0 \quad x^2-3=0$

$\sqrt{x^2}=\sqrt{2} \quad \sqrt{x^2}=\sqrt{3}$

$x=\pm\sqrt{2}$ and $x=\pm\sqrt{3}$

Quadratic Form Trinomials

middle exponent half biggest exponent

$x^6 = 24 - 10x^3$

$x^6+10x^3-24=0$

$(x^3+12)(x^3-2)=0$ $\quad -24, +10$

$x^3+12=0 \quad x^3-2=0$

$x^3=-12 \quad x^3=2$

$x=\sqrt[3]{-12} \quad x=\sqrt[3]{2}$

$x=-2.289 \quad x=1.260$ and 4 imaginary solutions

Factoring Trinomial when a is not 1

Bottoms Up method $a=16 \quad b=-8 \quad c=1$

$16r^2 - 8r + 1$

1) a·c, +b

$(r-4)(r-4)$ $\quad 16, 16$

$\left(r-\frac{1}{4}\right)\left(r-\frac{1}{4}\right)$

$-4, -4, -8$

2) Write Factors

$(4r-1)(4r-1)$

3) Divide by a

4) Simplify or Bottoms up

$48x^2 + 22x = 15$

$48x^2+22x-15=0$

$(x+40)(x-18)$ $\quad 48$

-720: $40, -18$; 22

$\left(x+\frac{5}{6}\right)\left(x-\frac{3}{8}\right)$

$(6x+5)(8x-3)=0$

$6x+5=0 \quad 8x-3=0$

$x=-\frac{5}{6} \quad x=\frac{3}{8}$

$18x^2 - 27x - 5$

AC Method

1) a·c, +b

$18, -5, -90$; $-30, 3$; -27

$18x^2-30x+3x-5$

$6x(3x-5)+1(3x-5)$

$(3x-5)(6x+1)$

2) Split middle term

3) Factor by grouping

$18 + 12y^4 + 2y^8$

Factor out GCF

$2y^8+12y^4+18$

$2(y^8+6y^4+9)$

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

9, 3, 3, 6

$8m^6 - 44m^3 + 48 = 0$

$4(2m^6-11m^3+12)=0$

$4\left(\frac{m^3-8}{2}\right)\left(\frac{m^3-3}{2}\right)=0$

$2\cdot12=24$; $-8, -3, -11$

$4(m^3-4)(2m^3-3)=0$

$m^3-4=0 \quad 2m^3-3=0$

$m^3=4 \quad m^3=3/2$

$m=\sqrt[3]{4} \quad m=\sqrt[3]{3/2}$

$m=1.587 \quad m=1.145$ and 4 imaginary solutions

$-4c^4 + 20c^2 = 21$

$0=4c^4-20c^2+21$

$0=4c^4-6c^2-14c^2+21$

$4\cdot21=84$; $-6, -14, -20$

$0=2c^2(2c^2-3)-7(c^2-3)$

$0=(2c^2-3)(2c^2-7)$

$2c^2-3=0 \quad 2c^2-7=0$

$c^2=\frac{3}{2} \quad c^2=\frac{7}{2}$

$c=\pm\sqrt{3/2} \quad c=\pm\sqrt{7/2}$

$c=1.225 \quad c=1.871$

$c=-1.225 \quad c=-1.871$

Binomial Difference of Squares

Binomial of two Perfect Squares

$a=1 \quad b=0 \quad c=-144$

$x^2 - 144$

-144: $12, -12$; 0

$(x+12)(x-12)$

$25d^2 - 100$

$\sqrt{25d^2}=5d$

$\sqrt{100}=10$

$(5d+10)(5d-10)$

$4a^3 - 64a$

$4a(a^2-16)$

$4a(a-4)(a+4)$

$\left(\sqrt{ax^2}+\sqrt{c}\right)\left(\sqrt{ax^2}-\sqrt{c}\right)$

$3b^3 - 27b = 0$

$3b(b^2-9)=0$

$3b(b+3)(b-3)=0$

$b=0 \quad b+3=0 \quad b-3=0$

$b=-3 \quad b=3$

$9x^3 = 25x$

$-25x \quad -25x$

$9x^3-25x=0$

$x(9x^2-25)=0$

$x(3x+5)(3x-5)=0$

$x=0 \quad 3x+5=0 \quad 3x-5=0$

$x=-\frac{5}{3} \quad x=\frac{5}{3}$

$7a^3 = 175a$ ✗ can't ÷ by a letter you'll lose an answer

$-175a \quad -175a$

$7a^3-175a=0$

$7a(a^2-25)=0$

$7a(a+5)(a-5)=0$

$a=0 \quad a+5=0 \quad a-5=0$

$a=-5 \quad a=5$