Factoring GCF – A – Squares Notes/Homework Name

Date

Factor out GCF

Greatest Common Factor GCF. (leftovers)

$15x + 35$

$5 \cdot 3x + 5 \cdot 7$

$5(3x+7)$

$-5 - x$

$-1 \cdot 5 + -1 \cdot x$

$-1(5+x)$

$-1(x+5)$

can factor out -1 to change signs

$14 - 7x$

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

$11 \cdot 5 \cdot p \cdot p - 11 \cdot p \cdot p \cdot p \cdot p + 11 \cdot 4 \cdot p \cdot p \cdot p \cdot p \cdot p$

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

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

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

$n(\quad)$

$3x^2 - 4x = 0$

$27x^3 - 108x = 0$

the highest exponent determines # of roots

$3 \cdot 9 \cdot x \cdot x \cdot x - 3 \cdot 9 \cdot 4 \cdot x = 0$

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

$\frac{27x}{27} = \frac{0}{27}$ $\quad x^2 - 4 = 0$

$x = 0$ $\quad \sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

undo x^2 with $\pm\sqrt{}$

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

Factor by Grouping

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

1) break up into pairs

2) Factor GCF out of each pair

3) Factor out GCF

$3x(4a+z) + y(4a+z)$

$(4a+z)(3x+y)$

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

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

Rewrite

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

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

not same

not factorable by grouping

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

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

Factor by Grouping and Solve

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

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

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

Sometimes you need to factor out 1 or -1

$3y - 2 = 0$ $\quad +2 \quad +2$

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

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

$2y + 1 = 0$ $\quad -1 \quad -1$

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

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

$12a^4 + 3A^2 - 8A^2 = 2$

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Greatest Common Factor

Factor out GCF GCF • (leftovers)

$15x + 35$ $5 \cdot 3 \cdot x + 5 \cdot 7$ $5(3x+7)$

$-5 - x$ $-1 \cdot 5 + -1 \cdot x$ $-1(5+x)$ $-1(x+5)$ can factor out -1 to change signs

$14 - 7x$

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

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

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

$3x^2 - 4x = 0$

Degree determines # of roots

$27x^3 - 108x = 0$ $3 \cdot 9(x \cdot x)x - 3 \cdot 9(4 \cdot x)$ $27x(x^2-4)=0$

$\frac{27x}{27} = \frac{0}{27}$ $x = 0$

$x^2 - 4 = 0$ $\sqrt{x^2} = \sqrt{4}$ $x = \pm 2$

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

Factor by Grouping

$12ax + 3xz + 4ay + yz$ $(3x)(4a+z) + y(4a+z)$ $(4a+z)(3x+y)$

1) break up into pairs
2) Fact GCF from each pair
3) Pull out GCF factor again • (leftovers)

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

$14y^3 - 28y^2 + 3y + 6$ $14(y \cdot y \cdot y) - 14(2 \cdot y \cdot y)$ $14y^2(y-2) + 3(y+2)$

not the same so not factorable by grouping

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

Factor by Grouping and Solve

$6y^2 - 4y + 3y - 2 = 0$ $2y(3y-2) + 1(3y-2) = 0$ $(3y-2)(2y+1) = 0$

Sometimes you must factor out a 1 or -1

$3y - 2 = 0$ $+2 \quad +2$ $\frac{3y}{3} = \frac{2}{3}$ $y = 2/3$

$2y + 1 = 0$ $-1 \quad -1$ $\frac{2y}{2} = \frac{-1}{2}$ $y = -1/2$

$12a^4 + 3a^2 - 8a^2 = 2$ $-2 \quad -2$ $12a^4 + 3a^2 - 8a^2 - 2 = 0$

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

$4a^2 + 1 = 0$ $\sqrt{a^2} = \sqrt{\frac{-1}{4}}$ $a = \pm \frac{1}{2}i$

$3a^2 - 2 = 0$ $\sqrt{a^2} = \sqrt{\frac{2}{3}}$ $a = \pm\sqrt{\frac{2}{3}}$

Factoring Trinomial when a = 1

$1x^2+bx+c$

$m \cdot n = c$, $m + n = b$ → $(x+m)(x+n)$

Quadratic Form: middle exponent is half biggest

$x^2 - x - 2$ (b=-1, c=-2) → $(x+1)(x-2)$

$x^2 - 4x + 3$ → $(x-3)(x-1)$

$c^4 + 7c^2 - 8$ → $(c^2+8)(c^2-1)$

$x^2 + 5x = -6$

$x^6 + 6 = 5x^3$

$x^8 = 24 - 10x^4$

Factoring Trinomial when a is not 1

① ax^2+bx+c, $a \cdot c$

$16r^2 - 8r + 1$ → $16r^2-4r-4r+1$ → $4r(4r-1)-1(4r-1)$ → $(4r-1)(4r-1)$

$18x^2 - 27x - 5$

$18 + 11y^4 + 2y^8$ → $(y^4+3)(2y^4+6)$

② Split middle Term

$48x^4 + 22x^2 = 15$

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

$-4c^8 + 20c^4 = 21$

③ Factor by grouping

$48x^4+22x^2-15=0$ → $48x^4+40x^2-18x^2-15$ → $8x^2(6x^2+5)-3(6x^2+5)$ → $0=(6x^2+5)(8x^2-3)$

$x^2 = -\frac{5}{6}$, $x = \pm i\sqrt{\frac{5}{6}}$

$x^2 = \frac{3}{8}$, $x = \pm\sqrt{\frac{3}{8}}$

Difference of Squares

$(x+\sqrt{c})(x-\sqrt{c})$ binomial w/subtraction

$x^2 - 144$ → $(x+12)(x-12)$

$25d^2 - 100$ → $(5d+10)(5d-10)$

$4a^3 - 64a$

$36^3 - 27b = 0$

$9x^3 = 25x$

$-25x \quad -25x$

$9x^3-25x=0$

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

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

$7a^3 = 175a$

$1x^2 + bx + c$ $\quad$ $m \cdot n$, $m + n = b$ → $(x+m)(x+n)$ or Quadratic Form

Factoring Trinomial when a = 1

$x^2 - x - 2$ $\quad$ ($b=-1$, $c=-2$) $\quad$ $(x-2)(x+1)$

$x^2 - 4x + 3$ $\quad$ $(x-3)(x-1)$

$c^4 + 7c^2 + 8$

$x^2 + 5x = -6$

$x^6 + 6 = 5x^3$ $\quad$ ★ must $=0$ $\quad$ $x^6 - 5x^3 + 6 = 0$ $\quad$ $(x^3-3)(x^3-2)=0$ $\quad$ $x^3-3=0$, $x^3-2=0$ $\quad$ $\sqrt[3]{x^3} = \sqrt[3]{3}$, $\sqrt[3]{x^3} = \sqrt[3]{2}$ $\quad$ $x=\sqrt[3]{3}$ $\quad$ $x=\sqrt[3]{2}$ and 4 imaginary

$x^8 = 24 - 10x^4$ (double)

Factoring Trinomial when a is not 1

AC Method: ax^2+bx+c
1) $a \cdot c$ / b
2) Split middle Term
3) Factor by grouping

$16r^2 - 8r + 1$ $\quad$ $16r^2 - 4r - 4r + 1$ $\quad$ $r(4r-1) - 1(4r-1)$ $\quad$ $(4r-1)(4r-1)$

$18x^2 - 27x - 5$

$18 + 11y^4 + 2y^8$ $\quad$ $(y^4+3)(2y^4+6)$

$48x^4 + 22x^2 = 15$

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

$-4c^8 + 1?c^4 + 21$ (20c⁴)

Difference of Squares

binomial of Perfect Squares no bx $\quad$ $(\sqrt{a}x + \sqrt{c})(\sqrt{a}x - \sqrt{c})$

$x^2 - 144$ $\quad$ ($b=0$, $c=-144$) $\quad$ $(x+12)(x-12)$

$25d^2 - 100$ $\quad$ $(5d+10)(5d-10)$

$4a^3 - 64a$

$3b^3 - 27b = 0$

$9x^3 = 25x$

$7a^3 = 175a$

Factoring GCF – A – Squares Notes/Homework

Name

Date

Factor out GCF

GCF (leftovers) — greatest common factor

$15x + 35$
$5(3x + 7)$
$5 \cdot 3x + 5 \cdot 7$

$-5 - x$
$-1(x + 5)$ — can factor out −1 to change signs

$14 - 7x$
$-7(2 + x)$
$-7(x + 2)$

$55p^2 - 11p^4 + 44p^5$
$11p^2(5 - p^2 + 4p^3)$
$11p^2(4p^3 - p^2 + 5)$

$14x^3 - 42x^5 - 49x^4$
$7x^3(2 - 6x^2 - 7x)$
$-7x^3(6x^2 + 7x - 2)$ — want lead exponent to be positive

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

$3x^2 - 4x = 0$
$3 \cdot x \cdot x - 4 \cdot x$
$x(3x - 4) = 0$
$x = 0$ $3x - 4 = 0$ $x = \frac{4}{3}$ — exponent determines # of solutions

$27x^3 - 108x = 0$
$3 \cdot 9 \cdot x \cdot x \cdot x - 3 \cdot 9 \cdot 4 \cdot x$
$27x(x^2 - 4) = 0$
$27x = 0$, $x = 0$
$x^2 - 4 = 0$, $\sqrt{x^2} = \sqrt{4}$, $x = \pm 2$

$45s^3 - 18s^2 = 0$
$9s^2(5s - 2) = 0$
$9s^2 = 0$, $s^2 = 0$, $s = \pm 0$ → 0 repeated twice
$5s - 2 = 0$, $5s = 2$, $s = \frac{2}{5}$

Factor by Grouping

1) break up terms into pairs
2) Factor GCF of pairs
3) Common factor leftovers pulled out

$12ax + 3xz + 4ay + yz$
$3x(4a + z) + y(4a + z)$
$(4a + z)(3x + y)$

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

$14y^3 - 28y^2 + 3y + 6$
$14y^2(y - 2) + 3(y + 2)$ — if not same can't factor

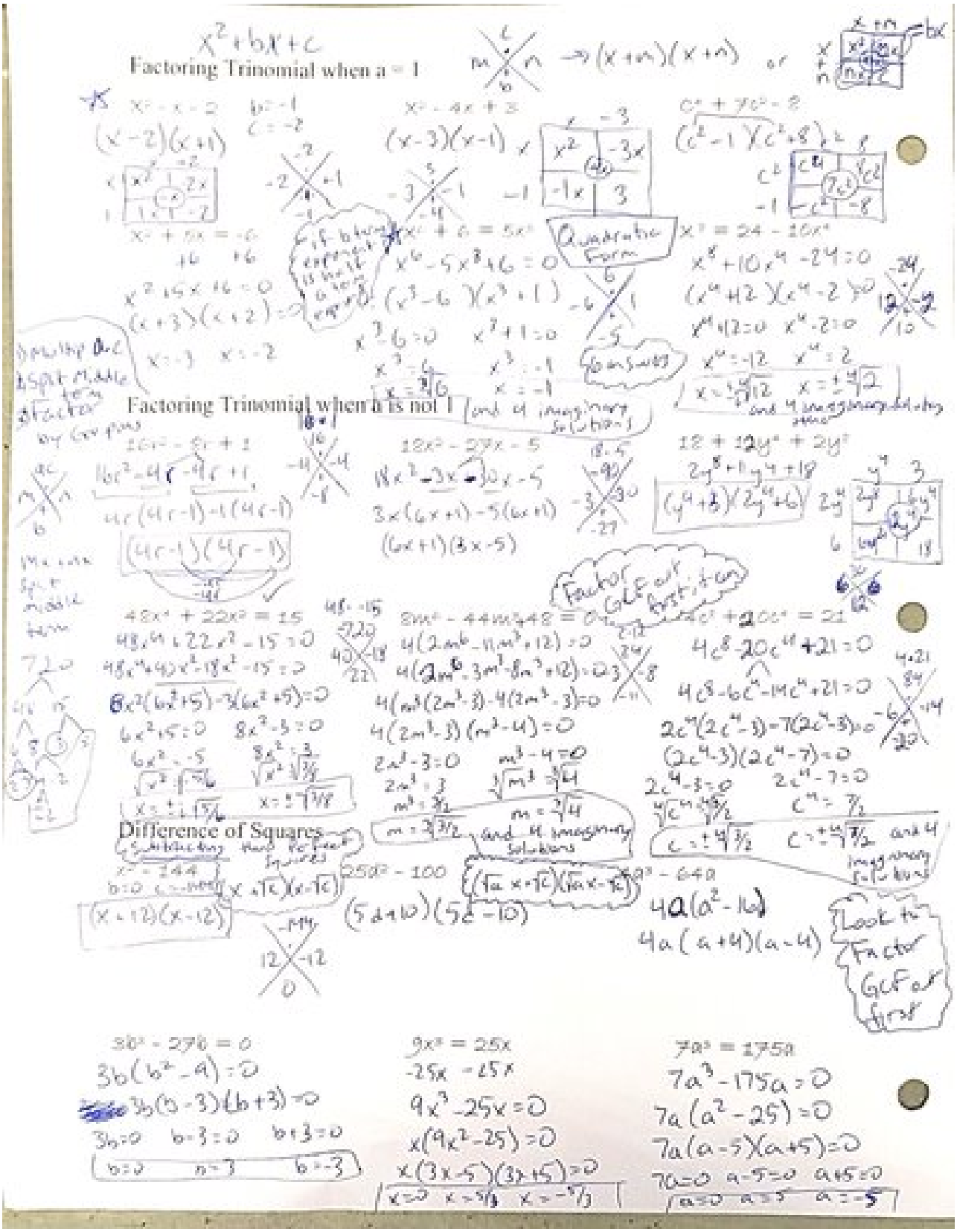
rewrite: $14y^3 - 28y^2 - 3y + 6$
$14y^2(y - 2) - 3(y - 2)$
$(y - 2)(14y^2 - 3)$

Factor by Grouping and Solve

Sometimes you need to just factor out 1 or −1

$6y^2 - 4y + 3y - 2 = 0$
$2y(3y - 2) + 1(3y - 2) = 0$
$(3y - 2)(2y + 1) = 0$
$3y - 2 = 0$ $2y + 1 = 0$
$y = \frac{2}{3}$ $y = -\frac{1}{2}$

$12a^4 + 3a^2 - 8a^2 = 2$
$-2 \quad -2$
$12a^4 + 3a^2 - 8a^2 - 2 = 0$
$3a^2(4a^2 + 1) - 2(4a^2 + 1) = 0$
$4a^2 + 1 = 0$ $3a^2 - 2 = 0$
$a^2 = -\frac{1}{4}$ $a^2 = \frac{2}{3}$
$a = \pm\frac{1}{2}i$ $a = \pm\sqrt{\frac{2}{3}} =$


Factoring Trinomial when a = 1
Factoring Trinomial when a is not 1
Difference of Squares
Quadratic Form
Factor GCF or Binomial first
Look to Factor GCF or Binomial first