

NAME:

Key

PERIOD:

2nd

UNIT 5

QUADRATIC FUNCTIONS FACTORING PACKET

Notes and Practice – GCF

Notes and Practice – Diff of Squares

Notes and Practice – Trinomials

Notes and Practice – Mixed Practice

Factoring GCF's

Factoring out a greatest common factor:

1. Determine what each term below has in common.

Ex 1. 3, 6, 9

$$(3)$$

Ex 2. 2x, 8x, -4x

$$(2x)$$

2. Factor the common value out by dividing each term by the common value.

Ex 3. $f(x) = \frac{4x}{4} + \frac{4}{4}$

$$4(x+1)$$

Ex 4. $f(x) = \frac{2x^2}{x} - \frac{3x}{x}$

$$x(2x-3)$$

Ex 5. $f(x) = \frac{2x}{2} + \frac{6y}{2} - \frac{12z}{2}$

$$2(x+3y-6z)$$

Ex 6. $f(x) = \frac{5x^3}{5x} + \frac{15x^2}{5x} - \frac{10x}{5x}$

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

3. You Practice:

1. $f(x) = \frac{8x^2}{x} + \frac{3x}{x}$

$$x(8x+3)$$

2. $f(x) = \frac{16x^3}{8x^2} - \frac{8x^2}{8x^2}$

$$8x^2(2x-1)$$

3. $f(x) = \frac{12x}{4} + \frac{4y}{4} - \frac{8z}{4}$

$$4(3x+y-2z)$$

4. $f(x) = 4x^3 + 18x^2 + 3x - 5$

cannot
factor

GCF - Additional Practice:

Factor the following by factoring out the GCF.

1. $\frac{2x+8}{2 \ 2}$

$2(x+4)$

2. $\frac{4x+16}{4 \ 4}$

$4(x+4)$

3. $\frac{6x-12}{6 \ 6}$

$6(x-2)$

4. $\frac{3+15x}{3 \ 3}$

$3(1+5x)$ or $3(5x+1)$

5. $\frac{2x^2-7x}{x \ x}$

$x(2x-7)$

6. $\frac{21x+14x^2}{7x \ 7x}$

$7x(3+2x)$ or $7x(2x+3)$

7. $\frac{4y+4x}{4 \ 4}$

$4(y+x)$

8. $\frac{8x^3-3x}{x \ x}$

$x(8x^2-3)$

9. $\frac{3x+9y-18z}{3 \ 3 \ 3}$

$3(x+3y-6z)$

10. $\frac{x^4+3x^3-12x}{x \ x \ x}$

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

Factoring Difference of Two Squares

$$a^2 - b^2 = (a + b)(a - b)$$

STEP 1: Check GCF First

STEP 2: Check to see if Difference of Squares can be done.

- * Is it a binomial (2 terms)?
- * Is it a subtraction problem?
- * Are both terms perfect squares?

Examples of Perfect Squares:

1, 4, 9, 16, 25, 36, 49, ...

$x \cdot x = x^2$
 $x^2 \cdot x^2 = x^4$
 $x^3 \cdot x^3 = x^6$
 $x^{10} \cdot x^{10} = x^{20}$

variables with even exponents are perfect squares

Ex 1. $x^2 - 9$

$$\begin{array}{cc} \diagup & \diagdown \\ x & 3 \\ \diagdown & \diagup \\ x & 3 \end{array}$$

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

Ex 2. $x^2 - 49$

$$\begin{array}{cc} \diagup & \diagdown \\ x & 7 \\ \diagdown & \diagup \\ x & 7 \end{array}$$

$$(x+7)(x-7)$$

Ex 3. $4x^2 - 25$

$$\begin{array}{cc} \diagup & \diagdown \\ 2x & 5 \\ \diagdown & \diagup \\ 2x & 5 \end{array}$$

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

Ex 4. $5x^2 - 20$

$$\begin{array}{cc} \diagup & \diagdown \\ 5 & 5 \\ \diagdown & \diagup \\ 5 & 5 \end{array}$$

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

$$\begin{array}{cc} \diagup & \diagdown \\ x & 2 \\ \diagdown & \diagup \\ x & 2 \end{array}$$

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

Ex 5. $x^{16} - 25$

$$\begin{array}{cc} \diagup & \diagdown \\ x^8 & 5 \\ \diagdown & \diagup \\ x^8 & 5 \end{array}$$

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

Ex 6. $x^8 - 100$

$$\begin{array}{cc} \diagup & \diagdown \\ x^4 & 10 \\ \diagdown & \diagup \\ x^4 & 10 \end{array}$$

$$(x^4+10)(x^4-10)$$

You Try:

1. $x^2 - 121$

$$\begin{array}{cc} \diagup & \diagdown \\ x & 11 \\ \diagdown & \diagup \\ x & 11 \end{array}$$

$$(x+11)(x-11)$$

2. $x^2 - 64$

$$\begin{array}{cc} \diagup & \diagdown \\ x & 8 \\ \diagdown & \diagup \\ x & 8 \end{array}$$

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

3. $9x^2 - 1$

$$\begin{array}{cc} \diagup & \diagdown \\ 3x & 1 \\ \diagdown & \diagup \\ 3x & 1 \end{array}$$

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

4. $2x^2 - 32$

$$\begin{array}{cc} \diagup & \diagdown \\ 2 & 16 \\ \diagdown & \diagup \\ 2 & 16 \end{array}$$

$$2(x^2 - 16)$$

$$\begin{array}{cc} \diagup & \diagdown \\ x & 4 \\ \diagdown & \diagup \\ x & 4 \end{array}$$

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

5. $x^9 - 36$

↑
odd exponent

Cannot factor

6. $x^{20} - 49$

$$\begin{array}{cc} \diagup & \diagdown \\ x^{10} & 7 \\ \diagdown & \diagup \\ x^{10} & 7 \end{array}$$

$$(x^{10}+7)(x^{10}-7)$$

Difference of Squares - Additional Practice:

Factor using the difference of two squares. If not possible, explain why.

1. $a^2 - 1$
 $\begin{matrix} \wedge & \wedge \\ a & 1 \end{matrix}$
 $(a+1)(a-1)$

2. $\frac{3a^2 - 12}{3}$
 $\begin{matrix} \wedge & \wedge \\ a & 2 \end{matrix}$
 $3(a^2 - 4)$
 $\begin{matrix} \wedge & \wedge \\ a & 2 \end{matrix}$
 $3(a+2)(a-2)$

3. $\frac{16c^2 + 4}{4}$
 $4(4c^2 + 1)$
 only a GCF

4. $c^2 - 4$
 $\begin{matrix} \wedge & \wedge \\ c & 2 \end{matrix}$
 $(c+2)(c-2)$

5. $k^2 - 19$
 $\begin{matrix} \wedge & \downarrow \\ k & \text{not perfect} \\ & \text{square} \end{matrix}$
 cannot factor

6. $t^4 - 1$
 $\begin{matrix} \wedge & \wedge & \wedge \\ t^2 & t & 1 \end{matrix}$
 $(t^2+1)(t^2-1)$
 $\begin{matrix} \wedge & \wedge \\ t & 1 \end{matrix}$
 $(t^2+1)(t+1)(t-1)$

7. $36j^2 - 121$
 $\begin{matrix} \wedge & \wedge & \wedge \\ 6j & 6 & 11 \end{matrix}$
 $(6j+11)(6j-11)$

8. $\frac{9x^8 - 81}{9}$
 $\begin{matrix} \wedge & \wedge \\ x^4 & 3 \end{matrix}$
 $9(x^4 - 9)$
 $\begin{matrix} \wedge & \wedge \\ x^4 & 3 \end{matrix}$
 $9(x^4+3)(x^4-3)$

9. $y^{10} - 4$
 $\begin{matrix} \wedge & \wedge & \wedge \\ y^5 & y^2 & 2 \end{matrix}$
 $(y^5+2)(y^5-2)$

10. $w^2 - 36$
 $\begin{matrix} \wedge & \wedge \\ w & 6 \end{matrix}$
 $(w+6)(w-6)$

11. $x^3 - 16$
 $\begin{matrix} \uparrow \\ \text{not} \\ \text{an even} \\ \text{exponent} \end{matrix}$
 cannot factor

12. $q^{12} + y^6$
 $\begin{matrix} \wedge & \wedge & \wedge \\ q^6 & q^6 & y^3 y^3 \end{matrix}$
 cannot factor
 not a subtraction problem

13. $c^2 - 8$
 $\begin{matrix} \wedge \\ c \end{matrix}$
 \uparrow
 not a perfect square
 cannot factor

14. $64 - c^8$
 $\begin{matrix} \wedge & \wedge \\ 8 & c^4 \end{matrix}$
 $(8+c^4)(8-c^4)$

15. $\frac{27x^6 - 12y^{12}}{3}$
 $\begin{matrix} \wedge & \wedge \\ 3x^3 & 2y^6 \end{matrix}$
 $3(9x^6 - 4y^{12})$
 $\begin{matrix} \wedge & \wedge \\ 3x^3 & 2y^6 \end{matrix}$
 $3(3x^3+2y^6)(3x^3-2y^6)$

Factoring Trinomials

STEP 1: Once in standard form, always check to see if there is a GCF First

$$ax^2 + bx + c$$

STEP 2: Check a-c method if it's a trinomial

- Multiply a-c and determine which pair of factors multiply to give you a-c but also add together to give you b.
- Replace the original b term with the 2 factors
- Separate your problem into 2 groups
- Determine the GCF of each group and factor it out (your parentheses should match if the trinomial is factorable and you've done it correctly)
- Regroup your insiders and your outsiders into parentheses

Ex 1. $2x^2 - 11x - 6$

$$\frac{2x^2 - 12x}{2x} + \frac{1x - 6}{1}$$

$$2x(x-6) + 1(x-6)$$

$$(x-6)(2x+1)$$

Ex 2. $x^2 + 9x + 20$

$$\frac{x^2 + 4x}{x} + \frac{5x + 20}{5}$$

$$x(x+4) + 5(x+4)$$

$$(x+4)(x+5)$$

Ex 3. $3x^2 + 2x - 8$

$$\frac{3x^2 - 4x}{x} + \frac{6x - 8}{2}$$

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

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

Ex 4. $x^2 - 7x - 18$

$$\frac{x^2 - 9x}{x} + \frac{2x - 18}{2}$$

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

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

Ex 3. $2x^2 + 13x + 6$

$$\frac{2x^2 + 1x}{x} + \frac{12x + 6}{6}$$

$$x(2x+1) + 6(2x+1)$$

$$(2x+1)(x+6)$$

Ex 4. $4x^2 + 3x + 1$

cannot factor

You Try:

1. $2x^2 + 7x + 3$

$$\frac{2x^2 + 1x}{x} + \frac{6x + 3}{3}$$

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

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

2. $x^2 + 8x + 12$

$$\frac{x^2 + 2x}{x} + \frac{6x + 12}{6}$$

$$x(x+2) + 6(x+2)$$

$$(x+2)(x+6)$$

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

$$\frac{7x^2 + 3x}{x} + \frac{-7x - 3}{-1}$$

$$x(7x+3) - 1(7x+3)$$

$$(7x+3)(x-1)$$

Special Cases:

Ex 1. ~~$x^2 + 10 = 11x$~~ $x^2 - 11x + 10$

$$\frac{x^2 - 1x}{x} + \frac{-10x + 10}{-10}$$

$$x(x-1) - 10(x-1)$$

$$(x-1)(x-10)$$

Ex 2. $\frac{5x^2 + 15x - 20}{5}$

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

$$\frac{x^2 - 1x}{x} + \frac{4x - 4}{4}$$

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

$$5(x-1)(x+4)$$

Factoring Trinomials - Additional Practice:

1. $3x^2 + 17x + 10$ $\begin{matrix} 30 \\ 2 \quad 15 \end{matrix}$
 $\frac{3x^2}{x} + \frac{2x}{x} + \frac{15x}{5} + \frac{10}{5}$
 $x(3x+2)5(3x+2)$
 $(3x+2)(x+5)$

2. $x^2 + 8x + 12$ $\begin{matrix} 12 \\ 2 \quad 6 \end{matrix}$
 $\frac{x^2}{x} + \frac{2x}{x} + \frac{6x}{6} + \frac{12}{6}$
 $x(x+2)6(x+2)$
 $(x+2)(x+6)$

3. $x^2 + 8x + 12$ $\begin{matrix} 12 \\ 2 \quad 6 \end{matrix}$
 $\frac{x^2}{x} + \frac{2x}{x} + \frac{6x}{6} + \frac{12}{6}$
 $x(x+2)6(x+2)$
 $(x+2)(x+6)$

4. $x^2 + 12x + 11$ $\begin{matrix} 11 \\ 1 \quad 11 \end{matrix}$
 $\frac{x^2}{x} + \frac{1x}{x} + \frac{11x}{11} + \frac{11}{11}$
 $x(x+1)11(x+1)$
 $(x+1)(x+11)$

5. $5x^2 - 7x + 2$ $\begin{matrix} 10 \\ -2 \quad -5 \end{matrix}$
 $\frac{5x^2}{x} - \frac{2x}{x} - \frac{5x}{-1} + \frac{2}{-1}$
 $x(5x-2)-1(5x-2)$
 $(5x-2)(x-1)$

6. $x^2 + 10x + 7x + 10$ $\begin{matrix} 10 \\ 2 \quad 5 \end{matrix}$
 $x^2 + 7x + 10$
 $\frac{x^2}{x} + \frac{2x}{x} + \frac{5x}{5} + \frac{10}{5}$
 $x(x+2)5(x+2)$
 $(x+2)(x+5)$

7. $6x^2 + x - 15$ $\begin{matrix} -90 \\ -9 \quad 10 \end{matrix}$
 $\frac{6x^2}{3x} - \frac{9x}{3x} + \frac{10x}{5} - \frac{15}{5}$
 $3x(2x-3)5(2x-3)$
 $(2x-3)(3x+5)$

8. $x^2 - 11x + 24$ $\begin{matrix} 24 \\ -8 \quad -3 \end{matrix}$
 $\frac{x^2}{x} - \frac{8x}{x} + \frac{3x}{-3} - \frac{24}{-3}$
 $x(x-8)-3(x-8)$
 $(x-8)(x-3)$

9. $4x^2 + 13x + 3$ $\begin{matrix} 12 \\ 1 \quad 12 \end{matrix}$
 $\frac{4x^2}{x} + \frac{1x}{x} + \frac{12x}{3} + \frac{3}{3}$
 $x(4x+1)3(4x+1)$
 $(4x+1)(x+3)$

10. $x^2 - 6x + 5$ $\begin{matrix} 5 \\ -1 \quad 5 \end{matrix}$
 $\frac{x^2}{x} - \frac{5x}{x} - \frac{1x}{-1} + \frac{5}{-1}$
 $x(x-5)-1(x-5)$
 $(x-5)(x-1)$

11. $x^2 - 3x - 4$ $\begin{matrix} -4 \\ -4 \quad 1 \end{matrix}$
 $\frac{x^2}{x} - \frac{4x}{x} + \frac{1x}{1} - \frac{4}{1}$
 $x(x-4)1(x-4)$
 $(x-4)(x+1)$

12. $4x^2 - 25x - 21$ $\begin{matrix} -84 \\ 3 \quad -28 \end{matrix}$
 $\frac{4x^2}{4x} - \frac{28x}{4x} + \frac{3x}{3} - \frac{21}{3}$
 $4x(x-7)3(x-7)$
 $(x-7)(4x+3)$

13. $x^2 - 2x - 48$ $\begin{matrix} -48 \\ -8 \quad 6 \end{matrix}$
 $\frac{x^2}{x} - \frac{8x}{x} + \frac{6x}{6} - \frac{48}{6}$
 $x(x-8)6(x-8)$
 $(x-8)(x+6)$

14. $28x^2 - 25x + 3$ $\begin{matrix} 84 \\ -21 \quad -4 \end{matrix}$
 $\frac{28x^2}{7x} - \frac{21x}{7x} - \frac{4x}{-1} + \frac{3}{-1}$
 $7x(4x-3)-1(4x-3)$
 $(4x-3)(7x-1)$

15. $x^2 + 3x - 18$ $\begin{matrix} -18 \\ 6 \quad -3 \end{matrix}$
 $\frac{x^2}{x} - \frac{3x}{x} + \frac{6x}{6} - \frac{18}{6}$
 $x(x-3)6(x-3)$
 $(x-3)(x+6)$

16. $\frac{x^3 + 12x^2 + 32x}{x}$ $\begin{matrix} 32 \\ 8 \quad 4 \end{matrix}$
 $* (x)(x^2 + 12x + 32)$
 $\frac{x^2 + 8x}{x} + \frac{4x}{4} + \frac{32}{4}$
 $x(x+8)4(x+8)$
 $x(x+8)(x+4)$

17. $\frac{2x^4 + 8x^3 + 8x^2}{2x^2}$ $\begin{matrix} 4 \\ 2 \quad 2 \end{matrix}$
 $* (2x^2)(x^2 + 4x + 4)$
 $\frac{x^2 + 2x}{x} + \frac{2x}{2} + \frac{4}{2}$
 $x(x+2)2(x+2)$
 $2x^2(x+2)(x+2)$

18. $\frac{18x^2 - 18x + 4}{2}$ $\begin{matrix} 18 \quad 4 \\ -3 \end{matrix}$
 $* (2)(9x^2 - 9x + 2)$
 $\frac{9x^2 - 3x}{3x} - \frac{6x}{3x} + \frac{2}{-2}$
 $3x(3x-1)-2(3x-1)$
 $2(3x-1)(3x-2)$

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Mixed Factoring - Additional Practice:

$$1. x^2 + 5x + 4$$

$$\begin{array}{r} 4 \\ \diagup \\ x^2 + 1x + 4x + 4 \\ \hline x \quad x \quad 4 \quad 4 \end{array}$$

$$x(x+1) + 4(x+1)$$

$$(x+1)(x+4)$$

$$2. 4x^2 - 18x - 10$$

$$\begin{array}{r} -10 \\ \diagup \\ 2(2x^2 - 9x - 5) \\ \hline 2x^2 - 10x + 1x - 5 \\ \hline 2x \quad 2x \quad 1 \quad 1 \end{array}$$

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

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

$$3. x^2 + 8x$$

$$\begin{array}{r} \diagup \\ x \quad x \end{array}$$

$$x(x+8)$$

$$4. x^2 + 9x + 14$$

$$\begin{array}{r} 14 \\ \diagup \\ x^2 + 2x + 7x + 14 \\ \hline x \quad x \quad 7 \quad 7 \end{array}$$

$$x(x+2) + 7(x+2)$$

$$(x+2)(x+7)$$

$$5. 2x^2 + 9x - 18$$

$$\begin{array}{r} -36 \\ \diagup \\ 2x^2 + 12x - 3x - 18 \\ \hline 2x \quad 2x \quad -3 \quad -3 \end{array}$$

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

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

$$6. x^2 - 8x + 12$$

$$\begin{array}{r} 12 \\ \diagup \\ x^2 - 2x - 6x + 12 \\ \hline x \quad x \quad -6 \quad -6 \end{array}$$

$$x(x-2) - 6(x-2)$$

$$(x-2)(x-6)$$

$$7. 5x^2 + 17x - 12$$

$$\begin{array}{r} -60 \\ \diagup \\ 5x^2 + 20x - 3x - 12 \\ \hline 5x \quad 5x \quad -3 \quad -3 \end{array}$$

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

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

$$8. x^2 - 64$$

$$\begin{array}{r} \diagup \\ x \quad x \quad 8 \quad 8 \end{array}$$

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

$$9. x^2 + 3x - 10$$

$$\begin{array}{r} -10 \\ \diagup \\ x^2 + 5x - 2x - 10 \\ \hline x \quad x \quad -2 \quad -2 \end{array}$$

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

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

$$10. x^2 + 13x + 40$$

$$\begin{array}{r} 40 \\ \diagup \\ x^2 + 5x + 8x + 40 \\ \hline x \quad x \quad 5 \quad 5 \end{array}$$

$$x(x+8) + 5(x+8)$$

$$(x+8)(x+5)$$

$$11. 2x^2 - 15x - 8$$

$$\begin{array}{r} -16 \\ \diagup \\ 2x^2 - 16x + 1x - 8 \\ \hline 2x \quad 2x \quad 1 \quad 1 \end{array}$$

$$2x(x-8) + 1(x-8)$$

$$(x-8)(2x+1)$$

$$12. 4x^2 + 20x$$

$$\begin{array}{r} \diagup \\ 4x \quad 4x \end{array}$$

$$4x(x+5)$$

$$13. x^2 - 4x + 3$$

$$\begin{array}{r} 3 \\ \diagup \\ x^2 - 1x - 3x + 3 \\ \hline x \quad x \quad -3 \quad -3 \end{array}$$

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

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

$$14. 3x^2 + 12x$$

$$\begin{array}{r} \diagup \\ 3x \quad 3x \end{array}$$

$$3x(x+4)$$

$$15. 3x^2 + 32x - 11$$

$$\begin{array}{r} -33 \\ \diagup \\ 3x^2 + 33x - 1x - 11 \\ \hline 3x \quad 3x \quad -1 \quad -1 \end{array}$$

$$3x(x+11) - 1(x+11)$$

$$(x+11)(3x-1)$$

16. $x^2 - 49$
 $\begin{array}{cc} \diagdown & \diagup \\ x & 7 \\ \diagup & \diagdown \\ x & 7 \end{array}$

$(x+7)(x-7)$

17. $x^2 + 6x - 27$
 $\begin{array}{cc} & -27 \\ & \diagdown \\ x^2 + 9x & -3x - 27 \\ & \diagup \\ x & -3 \end{array}$

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

18. $11x^2 + 14x - 16$
 $\begin{array}{cc} & -176 \\ & \diagdown \\ 11x^2 - 8x & + 22x - 16 \\ & \diagup \\ x & 2 \end{array}$

$x(11x-8) + 2(11x-8)$
 $(11x-8)(x+2)$

19. $\frac{3x}{3} - \frac{18y}{3} + \frac{6z}{3}$

$3(x-6y+2z)$

20. $25x^2 - 49$
 $\begin{array}{cc} \diagdown & \diagup \\ 5x & 7 \\ \diagup & \diagdown \\ 5x & 7 \end{array}$

$(5x+7)(5x-7)$

21. $x^2 + 2x - 80$
 $\begin{array}{cc} & -80 \\ & \diagdown \\ x^2 - 8x & + 10x - 80 \\ & \diagup \\ x & 10 \end{array}$

$x(x-8) + 10(x-8)$
 $(x-8)(x+10)$

22. $\frac{3x^2}{3} + \frac{15x}{3} + \frac{18}{3}$

$3(x^2 + 5x + 6)$
 $\begin{array}{cc} & 6 \\ & \diagdown \\ x^2 + 2x & + 3x + 6 \\ & \diagup \\ x & 3 \end{array}$
 $x(x+2) + 3(x+2)$
 $3(x+2)(x+3)$

23. $2x^2 - 9x + 10$
 $\begin{array}{cc} & 20 \\ & \diagdown \\ 2x^2 - 4x & - 5x + 10 \\ & \diagup \\ 2x & -5 \end{array}$

$2x(x-2) - 5(x-2)$
 $(x-2)(2x-5)$

24. $x^8 - 100$

$\begin{array}{cc} \diagdown & \diagup \\ x^4 & 10 \\ \diagup & \diagdown \\ x^4 & 10 \end{array}$
 $(x^4+10)(x^4-10)$

25. $x^2 - 5x - 6$
 $\begin{array}{cc} & -6 \\ & \diagdown \\ x^2 - 6x & + 1x - 6 \\ & \diagup \\ x & 1 \end{array}$

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

26. $\frac{4x^2}{4} + \frac{32x}{4} + \frac{28}{4}$

$4(x^2 + 8x + 7)$
 $\begin{array}{cc} & 7 \\ & \diagdown \\ x^2 + 1x & + 7x + 7 \\ & \diagup \\ x & 7 \end{array}$
 $x(x+1) + 7(x+1)$
 $4(x+1)(x+7)$

27. $64x^6 - x^{10}$

$x^4(64 - x^4)$
 $\begin{array}{cc} & 8 \\ & \diagdown \\ 8x & + x^2 \\ & \diagup \\ 8x & x^2 \end{array}$
 $x^4(8+x^2)(8-x^2)$

28. $\frac{2x^2}{2} - \frac{2x}{2} - \frac{4}{2}$

$2(x^2 - x - 2)$
 $\begin{array}{cc} & -2 \\ & \diagdown \\ x^2 - 2x & + 1x - 2 \\ & \diagup \\ x & 1 \end{array}$
 $x(x-2) + 1(x-2)$
 $2(x-2)(x+1)$

29. $\frac{12x^2}{3x} - \frac{3x}{3x}$

$3x(4x-1)$

30. $x^2 - 14x - 72$
 $\begin{array}{cc} & -72 \\ & \diagdown \\ x^2 - 18x & + 4x - 72 \\ & \diagup \\ x & 4 \end{array}$

$x(x-18) + 4(x-18)$
 $(x-18)(x+4)$