

3.1/3.2 – Add, Subtract and Multiply Polynomials  
Algebra 3

Name \_\_\_\_\_

Date \_\_\_\_\_ Block \_\_\_\_\_

Add or subtract the following polynomials

1.  $(6x + 7) + (3x + 8)$

$$9x + 15$$

2.  $(5x - 3) - (3x + 9)$

$$2x - 12$$

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

$$x^2 + 2x + 2$$

4.  $(x^2 - 4x + 5) + (-2x^2 + 7x - 10)$

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

5.  $(2x^2 - 2x + 6) + (11x^3 - x^2 - 2 + 5x)$

$$11x^3 + x^2 + 3x + 4$$

6.  $(x^2 - 8) - (3x^3 - 6x - 4 + 9x^2)$

$$-3x^3 - 8x^2 + 6x - 4$$

7.  $(5x^4 + x^2) + (7 + 9x^2 - 2x^4 + x^3)$

$$3x^4 + x^3 + 10x^2 + 7$$

8.  $(12x^2 + x) - (6 - 9x^2 + x^7 - 8x)$

$$-x^7 + 21x^2 + 9x - 6$$

Multiply the following polynomials

9.  $(2x + 3)(7x + 7)$

$$14x^2 + 35x + 21$$

10.  $(8x + 6)(x - 5)$

$$8x^2 - 34x - 30$$

11.  $(7x + 5)(4x + 6)$

$$28x^2 + 62x + 30$$

12.  $(4x + 8)(8x^2 - 3x - 4)$

$$32x^3 + 52x^2 - 40x - 32$$

13.  $(x - 7)(5x^2 - 3x - 5)$

$$5x^3 - 38x^2 + 16x + 35$$

14.  $(6x - 5)(7x^2 + x - 4)$

$$42x^3 - 29x^2 - 29x + 20$$

$$15. (5x^2 + 3x - 8)(2x^2 - 6x - 3)$$

	$5x^2$	$3x$	$-8$
$2x^2$	$10x^4$	$6x^3$	$-16x^2$
$-6x$	$-30x^3$	$-18x^2$	$48x$
$-3$	$-15x^2$	$-9x$	$24$

$$10x^4 - 24x^3 - 49x^2 + 39x + 24$$

$$16. (x^2 - 4x + 6)^2$$

	$x^2$	$-4x$	$6$
$x^2$	$x^4$	$-4x^3$	$6x^2$
$-4x$	$-4x^3$	$16x^2$	$-24x$
$6$	$6x^2$	$-24x$	$36$

$$x^4 - 8x^3 + 28x^2 - 48x + 36$$

Use the Binomial Theorem to expand the expressions

$$17. (3x - 1)^3$$

$$= 1(3x)^3(-1)^0 + 3(3x)^2(-1)^1 + 3(3x)^1(-1)^2 + 1(3x)^0(-1)^3$$

$$= 27x^3 - 27x^2 + 9x - 1$$

$$18. (x - 4)^4 =$$

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

$$= x^4 - 16x^3 + 96x^2 - 256x + 256$$

$$19. (a - 4b)^2$$

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

$$= a^2 - 8ab + 16b^2$$

$$20. (x + 2y)^3$$

$$= 1(x)^3(2y)^0 + 3(x)^2(2y)^1 + 3(x)^1(2y)^2 + 1(x)^0(2y)^3$$

$$= x^3 + 6x^2y + 12xy^2 + 8y^3$$

$$21. (2x - 1)^4$$

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

$$= 16x^4 - 32x^3 + 24x^2 - 8x + 1$$

$$22. (y - x^2)^3$$

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

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

3.4 Factoring All Ways  
Algebra 3

Name \_\_\_\_\_  
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Factor the polynomials completely

1.  $x^2 - 25$  Difference of squares

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

2.  $x^2 - 81$  DOS

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

3.  $2x^3 - 32x$  GCF, DOS

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

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

4.  $3x^2y - 12y$  GCF, DOS

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

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

5.  $4x^2 - 25$  DOS

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

6.  $9x^2 - 1$  DOS

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

7.  $x^3 - 8$  DO Cubes

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

8.  $3x^3 - 81$  GCF, DO C

$$3(x^3 - 27)$$

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

9.  $343 - x^3$  DO C

$$(7-x)(49+7x+49)$$

10.  $3x^4y + 24xy$  GCF, SO C

$$3xy(x^3+8)$$

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

11.  $6x^3 + 2x^2 - 3x - 1$  FBG

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

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

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

12.  $3x^3 + 3x^2 + 4x + 4$  FBG

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

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

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

13.  $6x^3 + 10x^2 - 9x - 15$  FBG

$$(6x^3 + 10x^2) + (-9x - 15)$$

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

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

14.  $12x^3 - 28x^2 - 3x - 7$  FBG

$$(12x^3 - 28x^2) + (3x - 7)$$

$$4x^2(3x-7) + 1(3x-7)$$

$$(4x^2+1)(3x-7)$$

$$15. 4x^3 + 10x^2 - 6x - 15 \text{ FBG}$$

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

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

$$17. 2x^3 + x^2 - 8x - 4 \text{ FBG, DOS}$$

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

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

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

$$19. x^4 - 3x^2 - 4 \text{ QF, DOS}$$

$$z = x^2$$

$$z^2 - 3z - 4$$

$$(z-4)(z+1) = \frac{(x^2-4)(x^2+1)}{(x+2)(x-2)(x^2+1)}$$

$$21. x^4 - 8x^2 + 12 \text{ QF}$$

$$z = x^2$$

$$z^2 - 8z + 12$$

$$(z-6)(z-2)$$

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

$$23. 2x^6 - 13x^3 - 24 \text{ QF, DOC}$$

$$z = x^3$$

$$2z^2 - 13z - 24$$

$$(2z+3)(z-8)$$

$$(2x^3+3)(x^3-8)$$

$$2z^2 - 16z + 3z - 24 = (2x^3+3)(x-2)(x^2+2x+4)$$

$$2z(z-8) + 3(z-8)$$

$$25. x^{10} - x^5 - 42 \text{ QF}$$

$$z = x^5$$

$$z^2 - z - 42$$

$$(z-7)(z+6)$$

$$(x^5-7)(x^5+6)$$

$$27. x^3 - 3x^2 + 3x - 1 \text{ Binomial}$$

$$(x-1)^3$$

$$29. x^4 - 12x^3 + 54x^2 - 108x + 81 \text{ BT}$$

$$(x-3)^4$$

$$16. 6x^3 - x^2 + 24x - 4 \text{ FBG}$$

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

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

$$18. 8x^3 - 20x^2 - 18x + 45 \text{ FBG, DOS}$$

$$4x^2(2x-5) - 9(2x-5)$$

$$(4x^2-9)(2x-5)$$

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

$$20. x^6 + 9x^3 + 8 \text{ QF, SOC}$$

$$z = x^3$$

$$z^2 + 9z + 8$$

$$(z+8)(z+1)$$

$$(x^3+8)(x^3+1) = (x+2)(x^2-2x+4)(x+1)(x^2-x+1)$$

$$22. 6x^4 - x^2 - 2 \text{ QF}$$

$$z = x^2$$

$$6z^2 - z - 2$$

$$6z^2 - 3z + 2z - 2$$

$$3z(2z-1) + 2(z-1)$$

$$6z^2 - 4z + 3z - 2$$

$$(2z+1)(3z-2)$$

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

$$24. 3x^6 - 7x^3 + 4 \text{ QF, DOC}$$

$$z = x^3$$

$$3z^2 - 4z - 3z + 4$$

$$z(3z-4) - 1(3z-4)$$

$$(z-1)(3z-4)$$

$$(x^3-1)(3x^3-4)$$

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

$$26. 2x^8 - 7x^4 - 4 \text{ QF } (x^4-4)(2x^4+1)$$

$$z = x^4$$

$$2z^2 - 7z + 1z - 4$$

$$2z(z-4) + 1(z-4)$$

$$(2z+1)(z-4)$$

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

$$28. x^4 + 8x^3 + 24x^2 + 32x + 16 \text{ BT}$$

$$(x+2)^4$$

$$30. x^3 + 15x^2 + 75x + 125 \text{ BT}$$

$$(x+5)^3$$