Name____________________________________

Honors Algebra 2 — Ch 6 (Part 1) Notes Packet

Section 6.1: Intro to Polynomials
Learning Target: We are learning about classifying, graphing and performing operations on polynomials. **Success Criteria:** • **I can identify, evaluate, add, and subtract polynomials.** • **I can classify and graph polynomials.**

<u>Monomials:</u> Numbers, variables or a product of numbers and variables with ______________________ exponents.

		CIRCLE the MONOMIALS
x $2x^3y$ 7 ½ a $gh^2j\bullet k$	$3/x$ 4^x $b^{3/4}$	50 x^y $5xyz$ $3w^{1/3}$ $2ab\bullet 4cd$

<u>Polynomials:</u> a monomial or the sum or difference of monomials where each monomial of a polynomial is called a ________________

		CIRCLE the POLYNOMIALS
$3x^5$ $2x^3 - 4x^7$ 7 $0.5a^6$ $d^4 + 2d^3 - 14x$	$5/a$ 5^x $z^{1/4}$ $g^{1.5}$ $\lvert 2b^3 - 5b\rvert$	$3x^2 - 4x^{-5}$ $2x/y$ $2x/3$ -7 $4c^5 - 7$ $-2x^{20} - x$

<u>CLASSIFYING POLYNOMIALS:</u>

1- **BY DEGREE** is one way to classify polynomials

- Degree of MONOMIALS: sum of all the exponents of all variables
- Degree of POLYNOMIALS: degree of the term with __________________ degree

Degree	Name	Example
0		
1		
2		
3		
4		
5		
n>5		

The degree of a polynomial is easy to find if polynomial is in ___________________________________

____________________________: polynomial written so terms are in order of descending degree (highest to lowest)

____________________________: coefficient of the first term if polynomial is written in standard form

CLASSIFYING POLYNOMIALS (continued):

2- **BY NUMBER OF TERMS** is another way to classify polynomials

# of terms	Name	Example
0		
1		
2		
3		
4		
5		
n>5		

Ex1: Identify the degree of the monomial

A. z^6

B. $8xy^2$

Ex2: State the leading coefficient, degree and number of terms. Classify/ name the polynomial.

A. $8x^4 + 3x^2 - 4$

B. $1 - 3x^5$

Ex3: Add/ subtract the polynomials

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

B. $(3 - 2x^2) - (x^3 + 2x^2 + 6 - x)$

Ex4: Graph on a graphing calculator. Describe graph, the real roots and other important features.

A. $f(x) = 2x^3 - 3x + 1$

Ex5: The cost of manufacturing a certain product can be approximated by $f(x) = 3x^3 - 18x + 45$ where x is the number of units of the product in hundreds. Evaluate f(0) and f(200) and describe what the value represents.

YOU TRY:

1. Identify the degree of the monomial: A. 5.67 B. a^2bc^3

2. State the leading coefficient, degree and number of terms. Classify/ name the polynomial.
   A. $2x^2$ B. $2x^2 - 4x^3 + 5x$

3. Add/ subtract the polynomials
   A. $(5x - 2x^3) - (3x^3 + x^2 - 4x + 2)$ B. $(4x^3 + 8 - 3x) + (2x^2 + 9 + 6x + 3x^3)$

4. Graph $f(x) = 2x^3 - 2$ on a graphing calculator. Describe graph, the real roots and other important features.

Section 6.2: Multiplying Polynomials
Learning Target: We are learning about multiplying polynomials. **Success Criteria:** • **I can multiply polynomials.** • **I can use binomial expressions that are raised to positive integer powers.**

Methods for multiplying polynomials:

1-

2-

Ex1: Multiply. Write in standard form.

A. Use distributive method: $fg^2 (f^4 + 3f^3g - 3f^2g^2 + fg^3)$

B. Use box method: $(a - 3)(2 - 5a + a^2)$

Ex2: A standard Burly Box is P ft by 3P ft by 4P ft. A large Burly Box has 1.5 ft added to each dimension. Write the volume function V(p) for the large box.

Ex 3: Find the product/ expand $(x + 2)^3$

YOU TRY:

1. Multiply $(y^2 – 7y + 5)(y^2 – y – 3)$ using BOTH methods. Write in standard form.

2. A small soup can has a radius of N inches and a height of 5N inches. A large soup can has 2 inches added to each dimension. Write the volume function V(n) for the large soup can. [$V_{cylinder} = \pi r^2 h$]

3. Find the product/ expand $(a + 2b)^3$

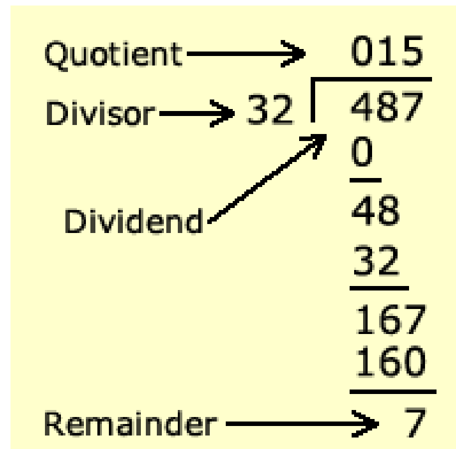
Section 6.3 Dividing Polynomials

Learning Target: We are learning about dividing polynomials.

Success Criteria:

- **I can use long division and synthetic division to divide polynomials.**
- **I can use synthetic substitution/ remainder theorem to evaluate the value of a polynomial**

Recall Long Division with Numbers:



Polynomial Long Division

Ex1:

A. $(x^2 + 5x - 28) \div (x - 3)$

B. $(-y^2 + 2y^3 + 25) \div (y - 3)$

Polynomial Synthetic Division

Ex2:

A. $(3x^2 + 9x - 2) \div (x - \frac{1}{3})$

B. $(3x^4 - x^3 + 5x - 1) \div (x + 2)$

Remainder Theorem: If $P(x) \div (x - a)$, then the remainder r = ________________________________
This means that when "a" is plugged into the polynomial then the resulting P(a) and remainder r are exactly the same! Using synthetic substitution is the fastest way to apply the remainder theorem.

Ex 3:

A. Find $P(x) = 3x^5 - x^4 - 5x + 10$ for $x = -2$

B. Find $P(x) = 6x^4 - 25x^3 - 3x + 5$ for $x = -\frac{1}{3}$

Compare to actually plugging the value in for x:

Ex 4: Write an expression that represents the area of the top face of a rectangular prism when the height is x + 2 and the volume of the prism is $x^3 - x^2 - 6x$

YOU TRY:

1. Divide using long division: $(3x^3 - 2x^2 + 2x - 5) \div (x - 2)$

2. Divide using synthetic division: $(3x^2 + 10x + 8) \div (x + 2)$

3. Find $P(x) = 3x^5 + 4x^2 + x + 6$ for $x = -1$

Section 6.4: Factoring Polynomials

Learning Target: We are learning about factoring polynomials.

Success Criteria:

- **I can use the Factor Theorem to determine the factors of a polynomial.**
- **I can factor the sum and difference of two cubes.**

Factor Theorem: For any polynomial P(x), (x – a) is a factor of P(x) if and only if P(a) = 0

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

$P(1) =$

$P(-1) =$

Therefore, (x – 1) and (x + 1) are factors

Ex1: Determine if the given binomial is a factor of P(x), if so write answer as a product.

A. $(x + 2)$, $P(x) = 3x^4 + 6x^3 - 5x - 10$

B. $(x + 1)$, $P(x) = x^2 - 3x + 1$

FACTORING POLYNOMIALS: some of the same skills used with quadratic factoring will be useful but we need to add new tools to the factoring toolbox!

- **Factor by Grouping:**

Ex2: A. $x^3 - x^2 - 25x + 25$

B. $2x^3 + x^2 + 8x + 4$

- **Sum/ Difference of Cubes (special factoring rules)**

Sum of 2 cubes:

Difference of cubes:

Ex3: A. $4x^4 + 108x$ B. $125d^3 - 8$

Ex4: The volume of a plastic storage box is modeled by the equation $V(x) = x^3 + 6x^2 + 3x - 10$. Find x for which $V(x) = 0$. (use graph to factor x)

YOU TRY

1. Determine if $(x - 2)$ is a factor of $P(x) = 5x^3 + x^2 - 7$, if so write answer as a product.

2. Factor: $8y^3 - 4y^2 - 50y + 25$

3. Factor: $128x^4 - 54x$

**Read p. 432 example problem and solution #4 for understanding & attempt to explain to someone else.

YOU TRY answers:

Sec 6.1:

1. A. zero degree
   B. 6^{th} degree
2. A. LC = 2, deg = 2, # terms = 1, name = quadratic monomial
   B. LC = – 4 , deg = 3, # terms = 3, name = cubic trinomial
3. A. $-5x^3 - x^2 + 9x - 2$
   B. $7x^3 + 7x^2 + 3x + 17$
4. Graph starts down, increases, flattens out then increases again. It crosses the x-axis once so it has one real root.

Sec 6.2:

1. $y^4 - 8y^3 + 9y^2 + 16y - 15$
2. $V(N) = \pi(5N^3 + 22N^2 + 28N + 8)$
3. $a^3 + 6a^2b + 12ab^2 + 8b^3$

Sec 6.3:

1. $3x^2 + 4x + 10 + \frac{15}{(x-2)}$
2. 3x – 4 [using synthetic division and getting a remainder of zero means (x + 2) is a factor
3. P(– 1) = 6

Sec 6.4:

1. R = 37 so (x – 2) is NOT a factor
2. (2y – 1)(2y – 5)(2y + 5)
3. $2x(4x - 3)(16x^2 + 12x + 9)$