Chapter _____: ____

Name ____ Period __________

#	Date	Section & Topic/Activity	Page

Chapter _____: ____

Name ____ Period ___________

#	Date	Assignment	Page	Score

Date	Test/Project	Score

6.1 Properties of Exponents (With Negative Exponents)

Name of Property	Formula
1. ______________________________	______________________________
2. ______________________________	______________________________
3. ______________________________	______________________________
4. ______________________________	______________________________
5. ______________________________	______________________________
6. ______________________________	______________________________
7. ______________________________	______________________________

Simplifying Expressions
A monomial expression is in simplified form when:

1. ____
2. ____
3. ____

Example 1: Simplifying Expressions Using Several Properties
Simplify. Assume that no variable equals 0.

a) $(4d^2t^5v^{-4})(-5dt^{-3}v^{-1})$

b) $(-2b^{-2}c^3)^3$

c) $\dfrac{(-m^4)^3}{(2m^2)^{-2}}$

d) $\left(\dfrac{2x^3y^2}{-x^2y^5}\right)^{-2}$

Example 2: Scientific Notation *A number is in scientific notation when it is in ____________________.

a) The density of an object is equal to its mass divided by its volume. A dumbbell has a mass of 9×10^3 grams and a volume of 1.2×10^3. What is the density of the dumbbell?

b) When light passes through water, its velocity is reduced by 25%. If the speed of light in a vacuum is 1.86×10^5 miles per second, at what velocity does it travel through water? Write you answer in scientific notation.

6.3 Dividing Polynomials (Day One)

In section 6.1, you learned to divide monomials. You can divide a polynomial by a monomial by using those same skills.

Example 1: Divide a Polynomial by a Monomial

a) $\frac{9x^2y^3 - 15xy^2 + 12xy^3}{3xy^2}$

b) $\frac{16a^5b^3 + 12a^3b^4 - 20ab^5}{4ab^3}$

c) $(20c^4d^2f - 16cf + 4cdf)(4cdf)^{-1}$

d) $(18x^2y + 27x^3y^2z)(3xy)^{-2}$

Example 2: Long Division (Quotient with No Remainder)

a) $(x^2 + 7x - 30) \div (x - 3)$

b) $(x^3 - 3x^2 + x - 3) \div (x^2 + 1)$

Example 3: Long Division (Quotient with Remainder)

a) $(x^2 - 3x - 7) \div (x + 2)$

b) $(2x^3 + 3x - 14) \div (x + 3)$

6.3 Dividing Polynomials (Day Two)

Synthetic Division
A simpler process for dividing a polynomial by a binomial. To use synthetic division, the divisor must be of the form...

____

LONG DIVISION VS SYNTHETIC DIVISION

Use **long division** to find:
$(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$

= ______________________________

Use **synthetic division** to find:
$(5x^3 - 13x^2 + 10x - 8) \div (x - 2)$

= ______________________________

Example 1: Synthetic Division (Divisor with First Coefficient 1)
Use synthetic division to find each quotient.

a) $(2x^3 + 3x^2 - 4x + 15) \div (x + 3)$

= ______________________________

b) $(3x^3 - 8x^2 + 11x - 14) \div (x - 2)$

= ______________________________

Example 2: Synthetic Division (Divisor with First Coefficient Other than 1)
Use synthetic division to find each quotient.

a) $(3x^4 - 5x^3 + x^2 + 7x) \div (3x + 1)$

= ______________________________

b) $(8x^5 - 2x^4 - 16x^2 + 4) \div (4x - 1)$

= ______________________________

6.4 Polynomials Functions (Day One)

Polynomial in One Variable

- The **degree** of a polynomial in one variable is the ______________________________ of its variable.
- The **leading coefficient** is the ____.

Example 1: Find Degrees and Leading Coefficients
State the degree and leading coefficient of each polynomial in one variable. If it is not a polynomial in one variable, explain why.

a) $7x^6 - 4x^3 + \frac{1}{x}$ **Polynomial?** Yes **OR** No ______________________________

b) $\frac{1}{2}x^2 + 2x^3 - x^5$ **Polynomial?** Yes **OR** No ______________________________

c) $7z^3 - 4z^2 + z$ **Polynomial?** Yes **OR** No ______________________________

d) $6a^3 - 4a^2 + ab^2$ **Polynomial?** Yes **OR** No ______________________________

Example 2: Function Values of Variables
Find p(3) and p(-1) for each function.

a) $p(x) = -x^3 + x^2 - x$

p(3) =

p(-1) =

b) $p(x) = x^4 - 3x^3 + 2x^2 - 5x + 1$

p(3) =

p(-1) =

If $p(x) = 2x^3 + 6x - 12 \text{ and } q(x) = 5x^2 + 4$, find each value.

a) $p(a^3)$

b) $5[q(2a)]$

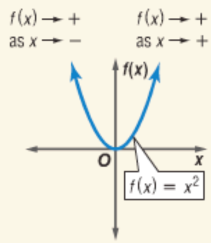
c) $3p(a) - q(a + 1)$

6.4 Polynomials Functions (Day One)

End Behavior
- is a description of what happens as *x* becomes large in the positive or negative direction
- is determined by the **degree** (highest exponent of polynomial) & the sign of the **leading coefficient**

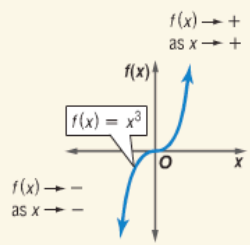
CONCEPT SUMMARY *End Behavior of a Polynomial Function*

Degree: even
Leading Coefficient: positive
End Behavior:



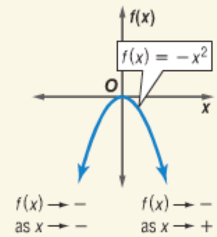
$y \to \infty$ as $x \to -\infty$
$y \to \infty$ as $x \to \infty$

Degree: odd
Leading Coefficient: positive
End Behavior:



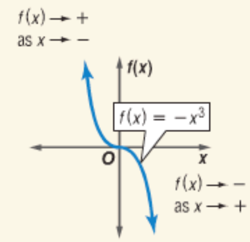
$y \to -\infty$ as $x \to -\infty$
$y \to \infty$ as $x \to \infty$

Degree: even
Leading Coefficient: negative
End Behavior:



$y \to -\infty$ as $x \to -\infty$
$y \to -\infty$ as $x \to \infty$

Degree: odd
Leading Coefficient: negative
End Behavior:

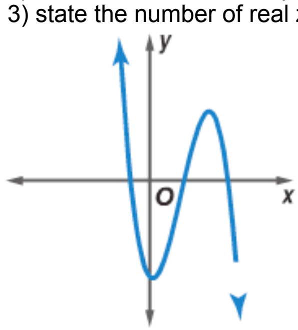


$y \to \infty$ as $x \to -\infty$
$y \to -\infty$ as $x \to \infty$

Example 3: Graphs of Polynomial Functions

For each graph,
1) describe the end behavior,
2) determine whether it represents an odd-degree or an even-degree polynomial function, and
3) state the number of real zeros

a)

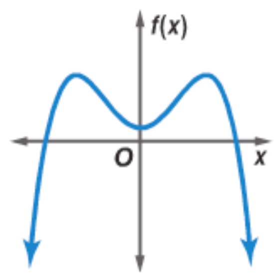


end behavior: ______________________________

____

degree? _________ **# of real zeros:** _________

b)

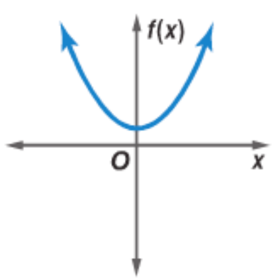


end behavior: ______________________________

____

degree? _________ **# of real zeros:** _________

c)

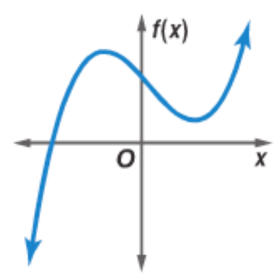


end behavior: ______________________________

____

degree? _________ **# of real zeros:** _________

d)



end behavior: ______________________________

____

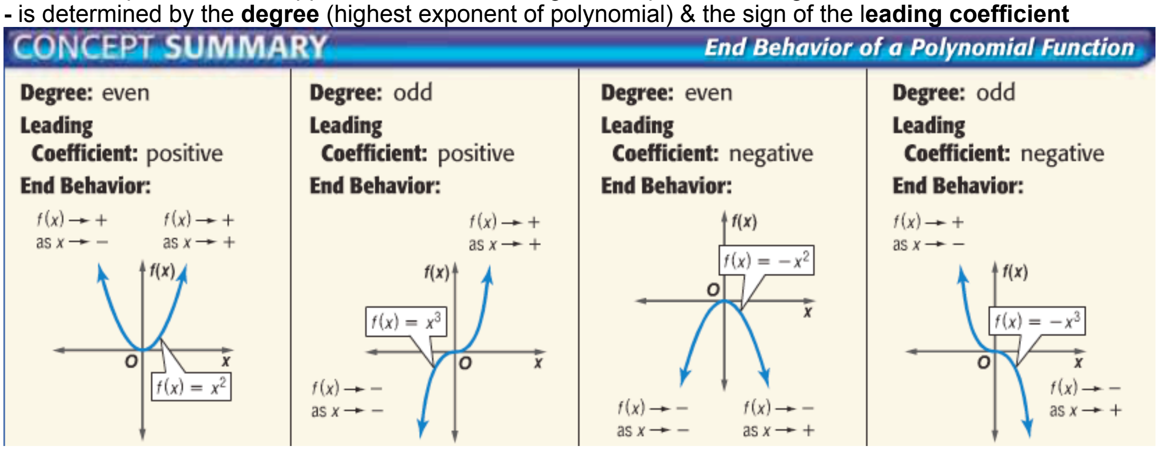
degree? _________ **# of real zeros:** _________

6.4 Polynomials Functions (Day Two)

In order to sketch the graph of a polynomial function, you need to:

(1) factor the polynomial to find all its **real zeros**; these are the x-intercepts of the graph
(2) determine the **end behavior** of the polynomial
(3) identify the **multiplicity** of each zero to determine the shape of the graph near each zero

End Behavior
- is a description of what happens as *x* becomes large in the positive or negative direction
- is determined by the **degree** (highest exponent of polynomial) & the sign of the **leading coefficient**



$y \to \infty$ as $x \to -\infty$	$y \to -\infty$ as $x \to -\infty$	$y \to -\infty$ as $x \to -\infty$	$y \to \infty$ as $x \to -\infty$
$y \to \infty$ as $x \to \infty$	$y \to \infty$ as $x \to \infty$	$y \to -\infty$ as $x \to \infty$	$y \to -\infty$ as $x \to \infty$

Multiplicity

Given *P(x) = A(x - c)^m*, where *c* is a zero (x-intercept) of the polynomial and *m* is the multiplicity:

if *m* is odd, $m \geq 1$ then the graph **crosses the x-axis** through that given zero
if *m* is even, $m > 1$ then the graph **touches the x-axis** (does not cross) at that given zero

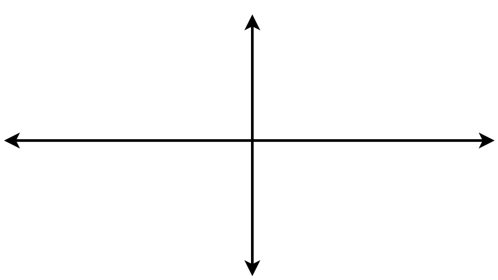
Example: Sketching Graphs of Polynomial Functions

a) $f(x) = -x^4 - x^3 + 6x^2$

Zeros:

End Behavior:

Multiplicity:

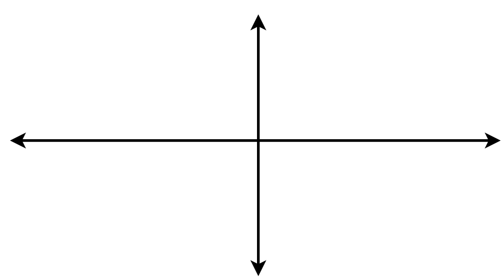


b) $f(x) = x^5 - 9x^3$

Zeros:

End Behavior:

Multiplicity:



Algebra 2CP
6-4 Graphing Polynomials

Graphing Polynomials Worksheet

Graphing Polynomials

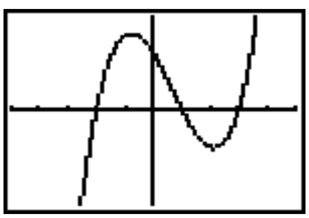
For each of the following polynomial functions, write the degree and find the given value.

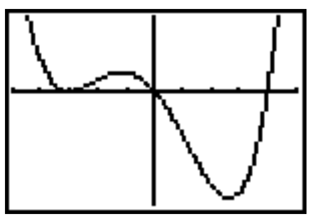
1. $f(x) = x^3 - 3x^2 + 2x - 1; f(2)$
2. $g(x) = 3x - x^2 + x^4 - 2x^3; g(1)$
3. $h(x) = x^5 - x^3 + 1; h(3)$

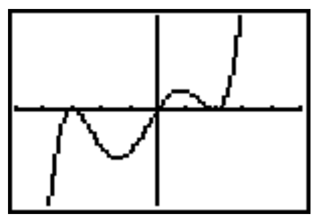
For each of the following polynomial functions:
a) find the zeros of the polynomial
b) find the degree of the polynomial
c) graph the polynomial. (HINT: Factor when necessary.)

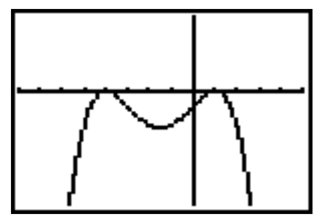
4. $f(x) = x(x-2)(x+3)$
5. $g(x) = (x-1)(x-3)(x+4)$
6. $h(x) = (x-1)(x-3)^2$
7. $f(x) = x^2(x-4)$
8. $g(x) = -x(x+1)(x-3)$
9. $h(x) = x^3 - 2x^2 - 8x$
10. $f(x) = x^4 - 4x^3 + 4x^2$
11. $g(x) = -2x^4 + 8x^2$

Write a possible polynomial function, in factored form, for each of the following graphs.

12.


13.


14.


15.


6.6 Solving Polynomial Equations

Factoring Techniques

The table below summarizes the most common factoring techniques used with polynomials.

CONCEPT SUMMARY — *Factoring Techniques*

Number of Terms	Factoring Technique	General Case
any number	Greatest Common Factor (GCF)	$a^3b^2 + 2a^2b - 4ab^2 = ab(a^2b + 2a - 4b)$
two	Difference of Two Squares Sum of Two Cubes Difference of Two Cubes	$a^2 - b^2 = (a + b)(a - b)$ $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$
three	Perfect Square Trinomials	$a^2 + 2ab + b^2 = (a + b)^2$ $a^2 - 2ab + b^2 = (a - b)^2$
	General Trinomials	$acx^2 + (ad + bc)x + bd = (ax + b)(cx + d)$
four or more	Grouping	$ax + bx + ay + by = x(a + b) + y(a + b)$ $= (a + b)(x + y)$

Whenever you factor a polynomial, **ALWAYS** go through the following steps:

Step 1: ______________________________

Step 2: ______________________________

Example 1: Factor Polynomials

Factor each polynomial completely.

a) $8yz - 6z - 12y + 9$

b) $y^2 - 5y + 4$

c) $z^3 + 125$

d) $t^3 - 8$

e) $3ax - 15a + x - 5$

f) $2b^2 + 13b - 7$

In Chapter 5, you learned to solve quadratic equations by factoring and using the Zero Product Property. You can extend these techniques to solve higher-degree polynomial equations.

Example 2: Solve Polynomial Equations

a) $x^4 - 29x^2 + 100 = 0$

b) $x^3 + 8 = 0$

c) $x^3 - 216 = 0$

d) $x^4 - 6x^2 - 27 = 0$

11.7 The Binomial Theorem

Pascal's Triangle
A triangular array of numbers such that the $(n + 1)^{th}$ row is the coefficient of the terms of the expansion $(x + y)^n$ for n = 0, 1, 2,...

Notice that **each row begins and end with 1**, and **each coefficient is the sum of the two coefficients above it** in the previous row.

$(a + b)^0$ 1
$(a + b)^1$ 1 1
$(a + b)^2$ 1 2 1
$(a + b)^3$ 1 3 3 1
$(a + b)^4$ 1 4 6 4 1
$(a + b)^5$ 1 5 10 10 5 1

_______ ___ ___ ___ ___ ___ ___ ___

_______ ___ ___ ___ ___ ___ ___ ___ ___

Example 1: Use Pascal's Triangle
Expand each power.

a) $(w + z)^5$

b) $(t - s)^6$

c) $(x + 2y)^5$

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