#

Algebra 2/Trig
Unit 5 Notes Packet

Name:
Date:
Period:

Higher Order Polynomial

1. Pg 348-349 #33, 37; 41-83 column and Pg 370 #35-44 column
2. Pg 348-349 #34, 38; 42-84 column and Pg 370 #36-45 column
3. Pg 356-357 #15-51 e.o.o. and Pg 369 #15-16
4. Pg 356-357 #16-52 e.o.e. and Pg 369 #17-18
5. Pg 362-363 #15-16; 23-24; 33-34; 47-48 and Pg 369 #21-22
6. Pg 362-363 #17-18; 25-26; 35-36; 49-50 and Pg 369 #23-24
7. Pg 362-363 #19-20; 27-28; 37-38; 51-52 and Pg 369 #25-26
8. Pg 333-334 #15-17; 27-28; 37-38; 49-50; 53-55; 65-67 and Pg 376-377 #13-14; 23-25 (use graph paper)
9. Pg 333-334 #18-20; 29-30; 39-40; 51-52; 56-58; 68-70 and Pg 376-377 #15-16; 26-28(use graph paper)
10. Worksheet
11. Worksheet
12. Worksheet
13. Chapter Review

A **polynomial function** is a function of the form

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \cdots + a_1 x + a_0$$

Where $a_n \neq 0$, the exponents are all whole numbers and the coefficients are all real numbers.

The Fundamental Theorem of Algebra
If f(x) is a polynomial of degree n where n > 0, then the equation f(x) = 0 has at least one root in the set of complex numbers.

In general, when all real and imaginary solutions are counted (with all repeated solutions counted individually), an nth-degree polynomial equation has exactly n solutions.

Directions: Using the Fundamental Theorem of Algebra, state the number of solutions (real and imaginary) and solve by factoring to find the solutions.

E1. Solve: $2x^5 + 24x = 14x^3$

P1. Solve: $2y^5 - 18y = 0$

E2. Solve: $x^4 - 8x^2 - 9 = 0$

P2. $x^4 + 9x^2 = 0$

E3. Write a polynomial function f of least degree that has real coefficients, a leading coefficient of 1, and 2 and $1 + i$ as zeros.

P3. Write a polynomial function f of least degree that has real coefficients, a leading coefficient of 1, and 1, and $-2 + i, and - 2 - i$ as zeros.

E1. Long Division
Divide $2x^4 + 3x^3 + 5x - 1$ by $x^2 - 2x + 2$

P1. Long Division
Divide $y^4 + 2y^2 - y + 5$ by $y^2 - y + 1$

E2. Synthetic Division
Divide $x^3 + 2x^2 - 6x - 9$ by $x - 2$

P2. Synthetic Division
Divide $x^3 - x^2 - 2x + 8$ by $x + 2$

Remainder Theorem
If a polynomial f(x) is divided by x – k, then the remainder is r = f(k)

E3. Use the remainder theorem to check your answer to example 2.

$If\ f(x) = x^3 + 2x^2 - 6x - 9$, find $f(2)$

P3. Use the remainder theorem to check your answer to practice 2.

$If\ f(x) = x^3 - x^2 - 2x + 8$, find $f(-2)$

Factor Theorem
A polynomial f(x) has a factor x – k if and only if f(k) = 0.

E4. Use the factor theorem to determine If the polynomial is a factor

Is $x + 3$ a factor of $x^3 + 2x^2 - 6x - 9$
Or
Does $f(-3) = 0\ if\ f(x) = x^3 + 2x^2 - 6x - 9$

P4. Use the factor theorem to determine if the polynomial is a factor

Is $x + 2$ a factor of $x^3 - x^2 - 2x + 8$
Or
Does $f(-2) = 0\ if\ f(x) = x^3 - x^2 - 2x + 8$

E5. Factor $f(x) = 2x^3 + 11x^2 + 18x + 9 \; given\ that \; f(-3) = 0.$

P5. Factor $f(x) = 3x^3 + 13x^2 + 2x - 8 \; given\ that \; f(-4) = 0.$

E6. $One\ zero\ of\ f(x) = x^3 - 2x^2 - 9x + 18\ is\ x = 2. Find\ the\ other\ zeros\ of\ the\ function.$

P6. $One\ zero\ of\ f(x) = x^3 + 6x^2 + 3x - 10\ is\ x = -5. Find\ the\ other\ zeros\ of\ the\ function.$

The Rational Zero Theorem

$If\ f(x) = a_n x^n + \cdots + a_1 x + a_0\ \ has\ integer\ coefficients, then\ every\ rational\ zero\ of\ f\ has$

$the\ following\ form:$

$$\frac{p}{q} = \frac{factor\ of\ constant\ term}{factor\ of\ leading\ coefficient}$$

E1. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of:\ f(x) = x^3 + 2x^2 - 11x - 12.$

P1. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of: f(x) = x^3 - 4x^2 - 11x + 30.$

E2. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of:$

a. $x^3 + 3x^2 + 16x + 48 = 0$

b. $f(x) = x^4 + 6x^3 + 12x^2 + 8x$

P2. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of:$

a. $x^2 - 14x + 49 = 0$

b. $x^4 + 3x^3 - 8x^2 - 22x - 24 = 0$

E3. Find all the zeros of $f(x) = x^5 - 2x^4 + 8x^2 - 13x + 6$

P3. Find all the zeros of $f(x) = x^3 + x^2 - x + 15$

E4. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of\!: f(x) = 10x^4 - 3x^3 - 29x^2 + 5x + 12$

P4. $Use\ the\ Fundamental\ Theorem\ of\ Algebra\ to\ state\ the\ number\ of\ solutions\ and$

$find\ the\ rational\ zeros\ of\!:\ Find\ all\ zeros\ of\ f(x) = 15x^4 - 68x^3 - 7x^2 + 24x - 4$

A **polynomial function** is a function of the form

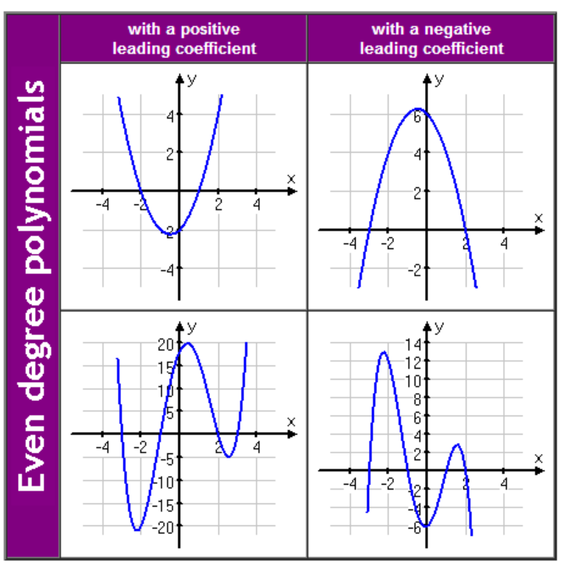
$$f(x) = a_n x^n + a_{n-1}x^{n-1} + \cdots + a_1 x + a_0$$

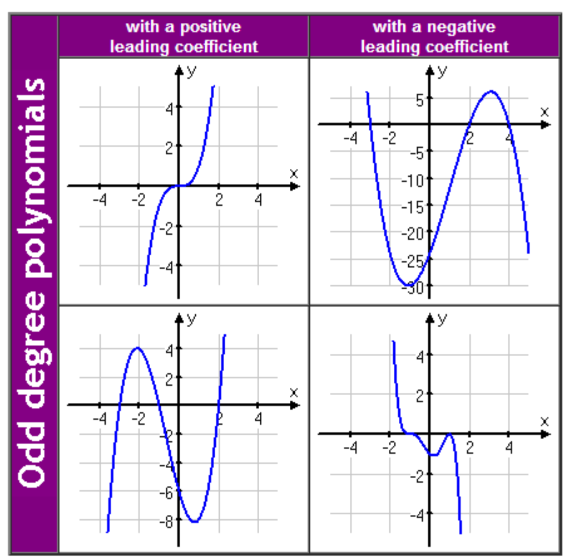
Where $a_n \neq 0$, the exponents are all whole numbers and the coefficients are all real numbers. a_n is the **leading coefficient**, a_0 is the **constant term**, and n is the **degree**. A polynomial function is in **standard form** if its terms are written in descending order of exponents from left to right.

Degree	Type
0	Constant
1	Linear
2	Quadratic
3	Cubic
4	Quartic

The end behavior of a polynomial function's graph is the behavior of the graph as x approaches positive infinity (+∞) or negative infinity (-∞). The expression x→ +∞ is read as "x approaches positive infinity."

End behavior of a polynomial function's graph is determined by the function's degree and leading coefficient.





E1. Decide whether the function is a polynomial function. If it is, write the function in standard form and state its degree, type, and leading coefficient.

a. $f(x) = \frac{1}{2}x^2 - 3x^4 - 7$

b. $f(x) = x^3 + 3^x$

c. $f(x) = 6x^2 + 2x^{-1} + x$

d. $f(x) = -0.5x + \pi x^2 - \sqrt{2}$

P1. Decide whether the function is a polynomial function. If it is, write the function in standard form and state its degree, type, and leading coefficient.

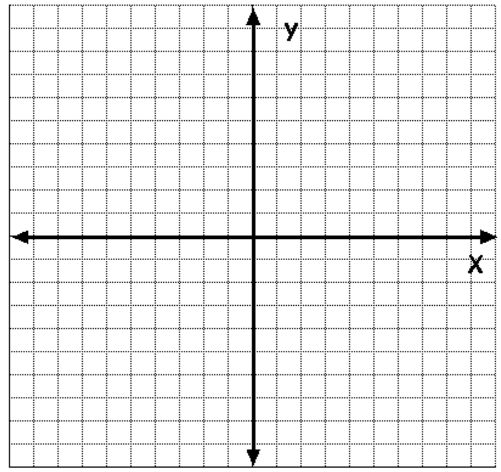
a. $f(x) = 2x^2 - x^{-2}$

b. $f(x) = -0.8x^3 + x^4 - 5$

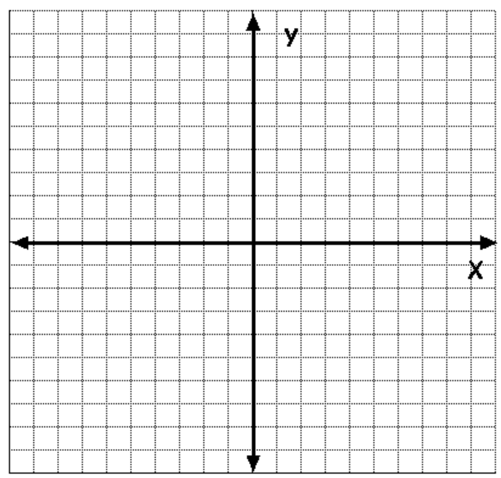
E2. Use synthetic substitution to evaluate $f(x) = 2x^4 - 8x^2 + 5x - 7$ when x = 3.

P2. Use synthetic substitution to evaluate $f(x) = 3x^5 - x^4 - 5x + 10$ when x = -2.

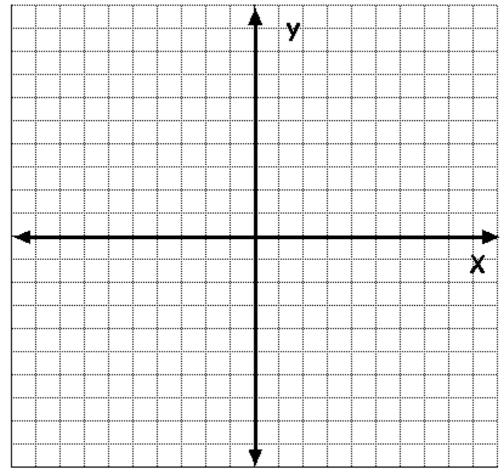
E3. Graph the function $f(x) = \frac{1}{4}(x + 2)(x - 1)^2$



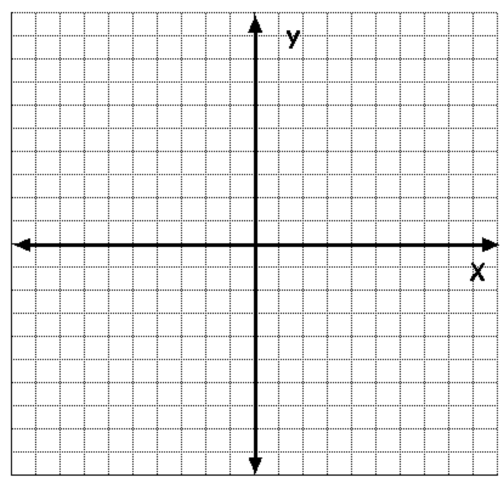
P3. Graph the function $f(x) = -2(x^2 - 9)(x + 4)$



E4. Graph: $f(x) = -x^4 - 2x^3 + 2x^2 + 4x$.



P4. Graph: $f(x) = x^3 + 2x^2 - x + 3$



Piecewise functions are represented by a combination of equations, each corresponding part to a domain.

$$f(x) = \begin{cases} 2x - 1, if\ x \leq 1 \\ 3x + 1,\ if\ x > 1 \end{cases}$$

This function is defined by two equations. One equation gives the values of f(x) when x is less than or equal to 1, and the other equation gives the values of f(x) when x is greater than 1.

E1. Evaluate the piecewise function $f(x) = \begin{cases} x^2 - 1, if\ x < 0 \\ \sqrt{x},\ if\ x \geq 0 \end{cases}$

(a). When x = -1

(b). When x = 0

(c). When x = 16

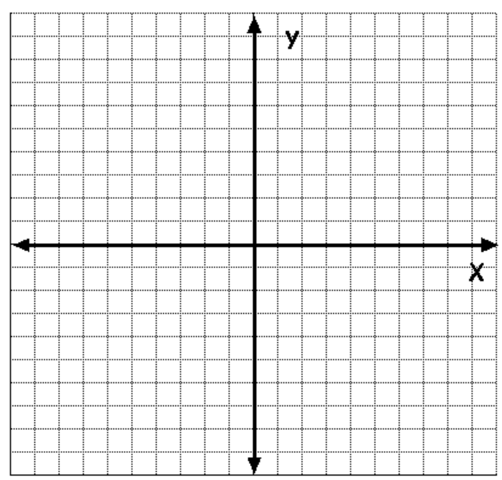
P1. Evaluate the piecewise function $f(x) = \begin{cases} 3x + 2, if\ x \leq 3 \\ x - 1,\ if\ x > 3 \end{cases}$

(a). When x = 0

(b). When x = 3

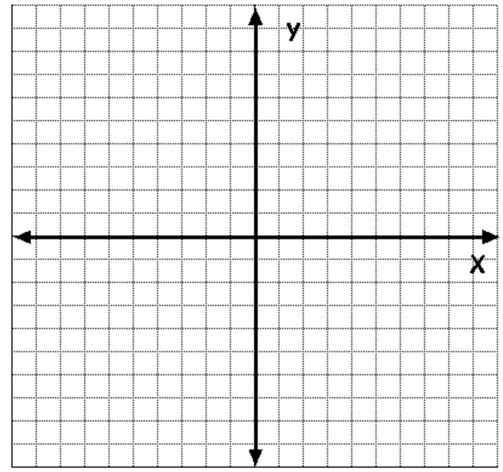
(c). When x = 6

E2. Graph this function: $f(x) = \begin{cases} \frac{2}{3}x + 2, if\ x > 2 \\ -x + 1,\ if\ x \leq 2 \end{cases}$



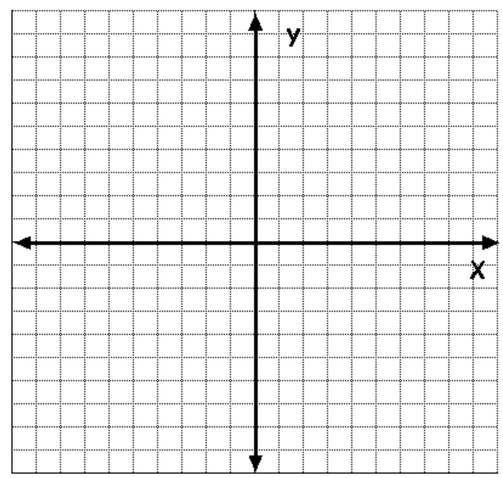
P2. Graph this function:

$$f(x) = \begin{cases} \frac{1}{2}x + 1, if\ x < 1 \\ -x + 3,\ if\ x \geq 2 \end{cases}$$



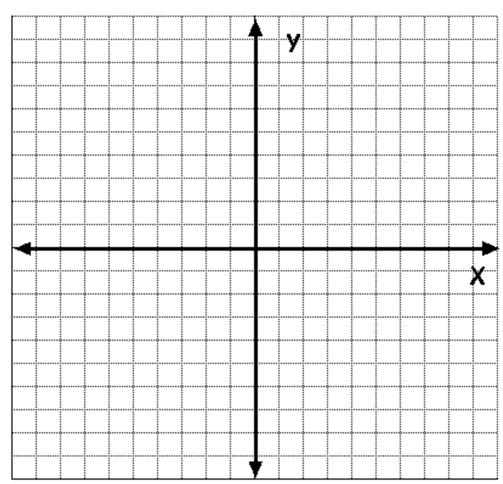
E3. Graph this function:

$$f(x) = \begin{cases} 3 - 2x, if\ x \leq 1 \\ (x-2)^2,\ if\ 1 < x < 4 \\ 1, \qquad if\ 5 \leq x \leq 6 \end{cases}$$



P3. Graph this function: $f(x) =$

$$\begin{cases} -x^2 + 4, & if -2 \leq x < 1 \\ 3, & if\ 1 \leq x < 3 \\ -\frac{3}{2}(x-5), & if\ 3 \leq x \leq 5 \end{cases}$$



E4. Write equations for the piecewise function whose graph is shown:

To the left of $x = 1$, the graph is part of the line passing through (____, __) and (__, __).

An equation for this line is $y =$ ______.

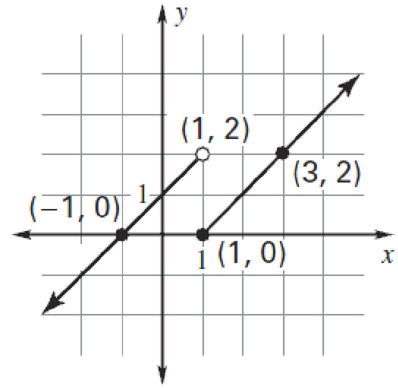
To the right of and including $x = 1$, the graph is part of the line passing through (__, __) and (__, __).

An equation for this line is y = ______.

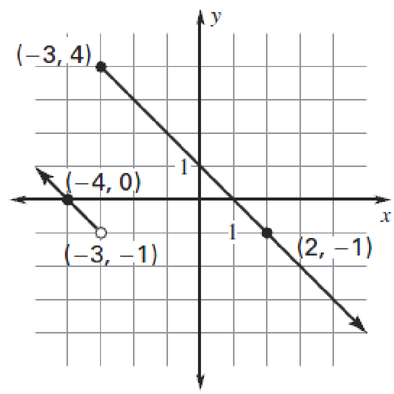
A piecewise function for the graph is

$$f(x) = \begin{cases} \\ \end{cases}$$

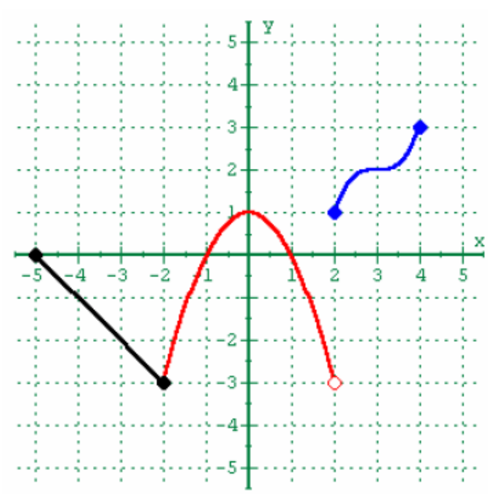
The function $f(x) =$ ______ does not apply to $x = 1$ because there is an open circle at (1, _), but $f(x) =$ ______ does apply to $x = 1$ because there is a solid circle at (1, _).



P4. Write equations for the piecewise function whose graph is shown:



E5. Write equations for the piecewise function whose graph is shown:



Warm-ups

Use the provided spaces to complete any warm-up problem or activity

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