

The Notebook Project – Algebra 2 Honors

This project is designed to improve study skills and organizational skills for a successful career in mathematics. You are to turn a composition notebook into a “Go To” textbook for easy reference and review.

*Table of Contents MUST BE located on the first several pages

Topics covered:

1) Functions

- a. Definition of Function, Domain, Range, & Vertical Line Test
- b. Examples of “Relations vs. Function”
 - i. List of points
 - ii. Mapping Diagram
 - iii. Graph
 - iv. Equations
 1. Ex: $f(x) = 3x^2$, $f(x) = 3x$, $x^2 + y^2 = 1$)
- c. Finding Domain of a function
 - i. Most functions (w/ example)
 - ii. Rational Functions (w/ steps & examples)
 - iii. Radical Functions (w/ steps & examples)
- d. Library of Functions
- e. Function Transformations [diagram & examples]
- f. Operation of Functions (w/ examples of each operation)
- g. Inverse Functions
 - i. Define one-to-one function
 - ii. Horizontal Line Test
 - iii. Finding the inverse of a function (*include steps to solve*)
 1. Example 1: $y = 5x - 7$
 2. Example 2: $y = \sqrt{x - 3}$

2) Quadratic Functions

- a. Define Quadratic Functions

- b. Solving Quadratics by Square Root Method (*include steps to solve*)
- i. Example: $x^2 - 16 = 0$
 - ii. Example: $(x + 1)^2 - 49 = 0$
 - iii. Example: $x^2 + 9 = 0$ *imaginary solutions*
 - iv. Example: $(7x + 3)^2 - 32 = -28$
- c. Solving Quadratics by Factoring Method (*include steps to solve*)
- i. Example: $x^2 + 5x - 24 = 0$
 - ii. Example: $x^2 + 3x + 2 = 0$
 - iii. Example: $3x^2 = 4 - 11x$
 - iv. Example: $9x^2 + 12 = 3 + 12x + 5x^2 = 0$
- d. Solving Quadratics by Quadratic Formula (*include steps to solve*)
- i. Example: $x^2 + 6x - 16 = 0$
 - ii. Example: $3x^2 = 4x + 7$
 - iii. Example: $-x^2 - 4x + 8 = 0$
- 3) Polynomial Functions
- a. Define: polynomial function, degree, root, & zero
 - b. Naming polynomials [Degree & Term] (w/ examples)
 - c. Operations with Polynomials
 - i. Adding
 - ii. Subtracting
 - iii. Multiplying by monomial
 - iv. FOIL-ing
 - d. Polynomial Long Division
 - i. Example: $\frac{x^4 - 2x^3 + 8x - 16}{x^2 - 2}$
 - e. Synthetic Division
 - i. Example: $\frac{x^4 - 2x^3 + 8x - 16}{x + 2}$
 - f. Remainder Theorem
 - i. Example: $P(2)$ for $P(x) = x^4 - 2x^3 + 8x - 16$

- g. Factor Theorem
 - i. Is $(x + 2)$ a factor for $P(x) = x^4 - 2x^3 + 8x - 16$
 - h. Fundamental Theorem of Algebra
 - i. Rational Roots Theorem/Rational Zeros Theorem
 - j. Finding the zeros of a polynomial function steps
- 4) Radical Functions
- a. The nth root (pg. 361 & 363)
 - b. Multiplying Radicals (pg. 367-368)
 - i. Problem 1 & 2
 - ii. Problem 4 & 5 (pg. 376-377)
 - c. Dividing Radicals (pg. 369)
 - i. Problem 4
 - d. Adding & Subtracting Radicals (pg.374-376)
 - i. Problem 1, 2, & 3
 - e. Rational Exponents
 - i. Essential Understanding (pg.381)
 - ii. Key Concept (pg. 382)
 - iii. Properties (pg. 383)
 - f. Radical Equations (*include steps to solve*)
 - i. Pick any 3 examples
 - g. Transformations of Radical Functions
- 5) Rational Functions
- a. Transformations of Rational Functions $y = \frac{1}{x-h} + k$
 - b. Standard Form Rational Functions
 - i. Finding Vertical Asymptotes
 - ii. Determining Horizontal Asymptotes
 - iii. Finding Holes
 - c. Operation with Rational Expressions
 - i. Simplifying
 - ii. Multiplying
 - iii. Division
 - iv. Addition

v. Subtraction

d. Solving Rational Expressions (*include steps to solve*)

i. Example: $\frac{4}{x-2} = \frac{x-1}{x-2}$

ii. Example: $\frac{2x+1}{6} + \frac{x}{2} = \frac{x-1}{3}$

iii. Example: $\frac{2}{x} + \frac{x+2}{x+1} = \frac{-2}{x^2+x}$

6) Exponential & Logarithmic Functions

a. Exponential Functions in general form $y = ab^x$

b. Growth vs. Decay

c. Transformations of Exponential Functions

d. The number e

e. Logarithmic Functions in general form

i. $y = \log_b x$

ii. $y = \ln x$

f. Converting Exponential & Logarithmic Functions

g. Properties of Logarithms

h. Solving Exponential Equations (*include steps to solve*)

i. $15^{3x} = 285$

ii. $2^x + 1 = 9$

iii. $2^{3x} = 4^{x+1}$

i. Solving Logarithmic Equations (*include steps to solve*)

i. $\log(4x - 3) = 2$

ii. $\log(x - 3) + \log x = 1$

7) Sequences

a. Arithmetic Sequences

i. Arithmetic Sequences & the common difference

ii. Explicit Rule of Arithmetic Sequence

iii. Recursive Rule of Arithmetic Sequence

iv. Finding the n^{th} term

1. Find the 100th term: 6, 11, 16, ...

2. Find the 32nd term: -9, -8.7, -8.4, ...

b. Geometric Sequences

- i. Geometric Sequences & the common ratio
- ii. Explicit Rule of Geometric Sequence
- iii. Recursive Rule of Geometric Sequence
- iv. Finding the n^{th} term
 1. Find the 10th term: 4, 12, 36, ...
- v. Creating an the Explicit Rule for a Geometric Sequence
 1. $a_2 = 80$ and $a_5 = 10$