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**IDX G9 MATH H+ STUDY GUIDE ISSUE 5**

**By Emma**

**1 Basic Functions**

* 1. **Linear Functions**

-function: a correspondence or rule that assigns to every element in a domain exactly one element in a range

Representation of Functions

1. Function rule:

or

1. Graph:

(independent variable), (dependent variable)

Zeros: x-intercepts (values, not coordinates)

-relation: any correspondence or rule that pairs the members of two sets

-vertical-line test: if no vertical line intersects a given graph in more than one point, then the graph is the graph of a function

-greatest integer function: assigns to each number the greatest integer less than or equal to the number (, the floor of x)

-, the ceiling of x

Linear Functions

-for any first-degree equation of ,

represents a line where are both not equal to zero

Inclination and Slope

-inclination: angle α, where , what is measured from the positive x-axis to the line

Different Forms

|  |  |  |
| --- | --- | --- |
| Slope-Intercept Form |  | Line has slope *m* and *y*-intercept *k* |
| Point-Slope Form |  | Line has slope *m* and contains |
| Two-Point Form |  | Line has two points |
| Intercept Form |  | Line has *x*-intercept *a* and *y*-intercept *b* |

Perpendicular and Parallel Lines

Given and

Distance from a Point to a Line

Given point *P* and line . The distance from *P* to *l* is

Distance between Parallel Lines

Given and . The distance between and Is

* 1. **Quadratic Function**

General form:

Vertex form:

*x*-intercept form:

-the graph of a quadratic function is symmetrical about the axis of symmetry

-when , the quadratic function opens upwards

-when , the quadratic function opens downwards

-when has a minimum value of on

-when has a maximum value of on

-if , the function has two *x*-intercepts

-if , the function has one *x*-intercept

-if , the function has none *x*-intercepts

* 1. **Complex Numbers**

-complex number: any number in the form where and

-*a* is the real part and *b* is the imaginary part of *z*

Complex Conjugates

-suppose where

-the complex conjugate of *z* is

Equality of Complex Numbers

Properties of Complex Conjugates

-

-

-

-

-

- for

-

- where is the modulus of

-

* 1. **Polynomial Functions**

-for , the function is given by

-power functions: polynomial functions of the form

Properties of Polynomial Functions

1. End behaviors

Leading coefficient test: determine the rise or fall by the polynomial function’s degree and by its leading coefficient

1. Real zeros

A function of degree *n* has at most *n* real zeros and turns

Rational Root Test

-when the polynomial has integer coefficients, every rational zero of has the form where have no common factors other than 1, *p* is a factor of the constant term and *q* is a factor of the leading coefficient

The Division Algorithm

-when and are polynomials such that , and the degree of is less than or equal to the degree of , there exist unique polynomials and such that

-synthetic division

Remainder Theorem and Factor Theorem

-when the polynomial is divided by , the remainder is

-if is the factor of polynomial , then

Fundamental Theorem of Algebra

-if is a polynomial of degree *n*, then has exactly *n* zeros, each of which may be written in the form where

1. Every real polynomial of degree *n* can be factorized into *n* complex linear factors, some of which may be repeated
2. Every real polynomial can be expressed as a product of real linear and real irreducible quadratic factors, where
3. Every real polynomial of degree *n* has exactly *n* zeros, some of which may be repeated
4. If is a zero of a real polynomial then its complex conjugate is also a zero
5. Every real polynomial of odd degree has at least one real zero

Vieta’s Theorem

-for the polynomial function , the sum of the zeros is , and the product of the zeros is

1. **Equations and Inequalities**

**2.1 Solve Equations**

-for quadratic equation

the real roots of the equation are

-if , then are the roots of

Polynomial equations

Equations with absolute values

Relationship between functions and equations

-for equation , the *x*-coordinate of the intersections of and the solutions to or

Irrational equations

Fractional equations

Partial fractions

System of equations

**2.2 Solve Inequalities**

Compare real numbers

For ,

For

Properties in equalities

Solve quadratic inequalities

-the connection between functions, equations, and inequalities is important in algebra

Inequality with absolute values

Basic forms:

1. or

General method to solve inequality with absolute values

Solve polynomial inequalities

For polynomial inequality

1. Use zeros to cut into intervals:
2. Since that for )m the left-hand side is positive, sketch the number line and mark all zeros. From the right-hand side, the graph of is above the number line, and the rest of the graph can be completed with wave-shaped
3. When is even, it bounces back at; when is odd, it crosses at

Solve irrational inequalities

For inequalities or

1. The possible values of *x* where
2. Discuss the cases of and
3. When , we can square both sides