Review

Algebra:

**Polynomials** – An expression constructed from variables and constants, using only the operations of addition, subtraction, multiplication, and non-negative, whole number exponents.

**Degree** – Highest power in a polynomial that appears before a non 0 coefficient

**Root** – value of the input variable that makes the output value = 0 (x-intercept)

Ex:

|  |  |  |
| --- | --- | --- |
| Root  3x + 46 = 0  3x = – 46  x = | Linear Root  ax + b = 0  x = | Quadratic Root (Use quadratic formula)  ax2 + bx + c = 0 |

**Quadratic Formula Proof**

Factor out a:

x2 + + = = 0 where a ≠ 0

* Complete the square:
* take half the coefficient of the x-term, square it and add the square to both sides

* simplify

* factor the left side / find lowest common denominator on right

* simplify

* square root both sides

* simplify

**Completing the square**

where p and q are constant

for this to be true

incomplete

**Completing the square formula**

**Vertex of parabola:**

**Completing the square – Quadratic Formula**

= 0

Examining a formula:

* **opens up** because coefficient of is 2 which is
* the **y intercept** occurs when

* x intercept occurs when (use the quadratic formula)
* if :
  + then there are 2 intercepts
  + then there is 1 intercept
  + then there are 0 intercepts
  + Therefore there is no **x intercept** as
* The vertex is at

Chapter 1

Section 1.1 Functions and Models

A **function** f is a rule that assigns to each element x in a set D exactly one element, called f(x), in a set E.

**Domain:** The set of valid values that can be entered into the function.

**Range:** The set of all possible values of f(x) as x varies throughout the domain.

**Independent variable:** A symbol that represents an arbitrary number in the domain of a function.

**Dependent variable:** A symbol that represents a number in the range of a function.

**Four ways to represent a function:**

* Verbally (in words)
* Numerically (table of values)
* Visually (a graph)
* Algebraically (explicit formula)

**Arrow Diagram:**

a

f(x)

f(a)

x

**Vertical Line Test:**

A curve in the xy-plane is the graph of a function of x if and only if no vertical line intersects the curve more than once.

**Piecewise Defined Functions:**

Functions that are defined by different formulas in different parts of their domain

**Symmetry**

Even Function:

* Is symmetrical along the y-axis

Odd Function:

* With half the graph you can rotate it about the origin to obtain the other half

**Increasing and Decreasing Functions**

A function is called increasing on an interval I if:

whenever in I

A function is called decreasing on I if:

whenever in I

Section 1.2 Mathematical Models a Catalog of Essential Functions

Mathematical Models:

* is a description often given as a function or equation of a real-world phenomenon
* they help us to understand the phenomenon and perhaps make predictions about future behaviour
* is never a completely accurate representation of the physical situation but an **idealization**
* a good model simplifies reality enough to allow us to use mathematical calculations but is accurate enough to provide valuable conclusions

Interpret

Solve

Formulate

Real-world predictions

Mathematical Model

Mathematical Conclusions

Real-world problem

Test

|  |  |
| --- | --- |
| **Type** | **Description** |
| **Polynomial**  Domain:  If the leading coefficient then the degree of is n. | Where and the numbers to are constants called coefficients. |
| **Linear**  Interpolation: estimate value between observed values  Extrapolation: prediction of value outside of observation | **Polynomial of the 1st degree**    Slope intercept form:   * grow at constant rate * use the empirical model for lawless models |
| **Quadratic**  Forms a parabola derived from   * opens up if > 0 * opens down if < 0 | **Polynomial of the 2nd degree**  **or**  Quadratic formula: |
| **Cubic** | **Polynomial of the 3rd degree**    **or** |
| **Power**  Even result in a parabola. | If n determines whether the function is even or odd. Also as n increases the parabola becomes steeper when . |
| **Root**  Domain: [0, ) |  |
| **Reciprocal function**  Forms a hyperbola |  |
| **Rational**  Any rational function can be rewritten sum of a polynomial and another rational function with a degree that is less in the numerator. | where and are polynomials and  using long division    Polynomial + another rational function where the degree is less in the numerator. |
| **Algebraic**  Any rational function is automatically an algorithm | A function that can be constructed using algebraic operations starting with polynomials |
| **Trigonometric**  Identities: | A function that uses radian measure (sine, cosine, tangent, cotangent, secant, cosecant) n = integer |
| **Exponential**  Domain:  Range: | (for ) |
| **Logarithmic** | (for ) |
| **Transcendental** | A non-algebraic function. (Trigonometric, exponential and logarithmic functions. |