Cohen Math Prep: Regents Review Series — Side 1

Algebra I (Common Core) Study Sheet

Linear Equations

LINES

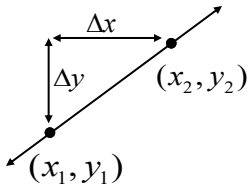
*Defined by: **constant** rate of change AKA **slope**

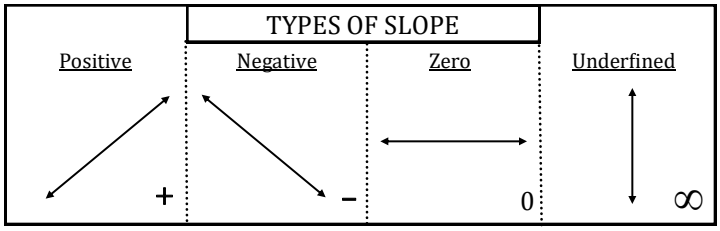
Slope-Intercept Form: $y = mx + b$ (slope: m; y-intercept: b)

Point-Slope Form: $y - y_1 = m(x - x_1)$

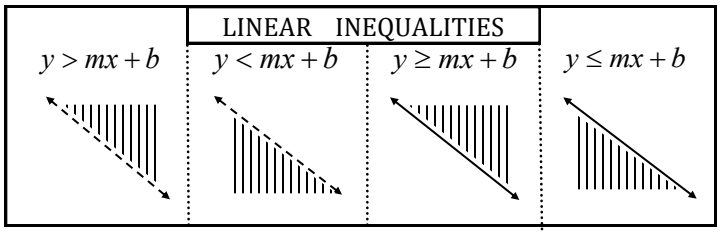
Slope Between 2 Points:

$$m = \frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$





Parallel Slopes: $m_{\parallel} = m$ VS. Perpendicular Slopes: $m_{\perp} = -\frac{1}{m}$



Types Of Number

- **Natural #'s**: {1, 2, 3, … }
- **Whole #'s**: {0, 1, 2, 3, …}
- **Integers**: {…–3, –2, –1, 0, 1, 2, 3, … }
- **Rational #'s**: Ratio of any 2 integers 'a' and 'b' (in the form: $\frac{a}{b}$)
- **Irrational #'s**: Not rational… "weird" #'s like: $\pi, \sqrt{2}, -\sqrt{6}, e$
- **Real #'s**: The set of all Rationals & Irrationals

Quadratic Equations

PARABOLAS

Standard Form: $y = ax^2 + bx + c$

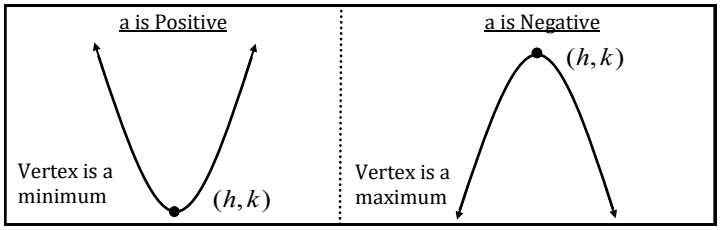
Vertex Form: $y = a(x - h)^2 + k$

Same Sign

Opposite Sign

Vertex is at: (h, k)

* "a" tells if parabola opens up or down



3 Methods to "Solve" Quadratic Equations:

*"Solutions" AKA: "roots", "zeros", or x-intercepts"

1) Factoring (easiest method when possible)

* $0 = (x - m)(x - n) \Leftrightarrow x = m$ & $x = n$
* if solving an equation in the form: $0 = x^2 + bx + c$ find 'm' and 'n' such that: $m \cdot n = c$ & $m + n = b$
* remember difference of squares: $x^2 - m^2 = (x + m)(x - m)$

2) Completing the Square

$$x^2 + bx = c \Longrightarrow (x + \frac{b}{2})^2 = c + (\frac{b}{2})^2$$

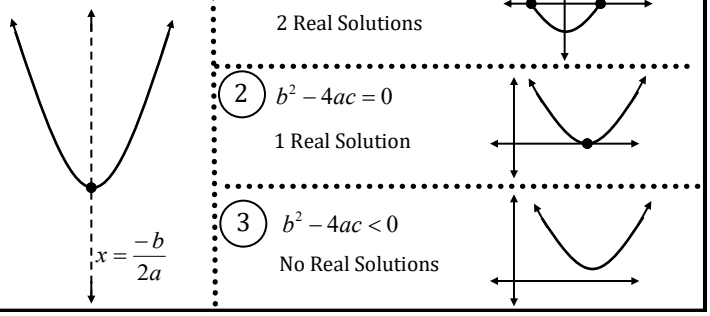
3) Quadratic Formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Axis of Symmetry: $x = \frac{-b}{2a}$

Discriminant

1. $b^2 - 4ac > 0$ — 2 Real Solutions
2. $b^2 - 4ac = 0$ — 1 Real Solution
3. $b^2 - 4ac < 0$ — No Real Solutions

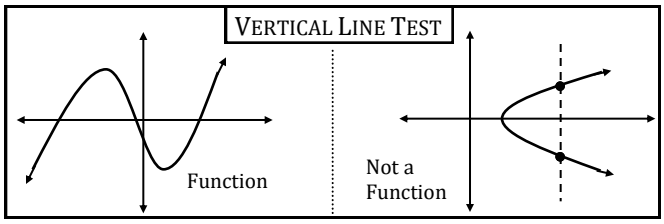


Cohen Math Prep: Regents Review Series — Side 2

Algebra I (Common Core) Study Sheet

Functions

Definition: **only** 1 output per input



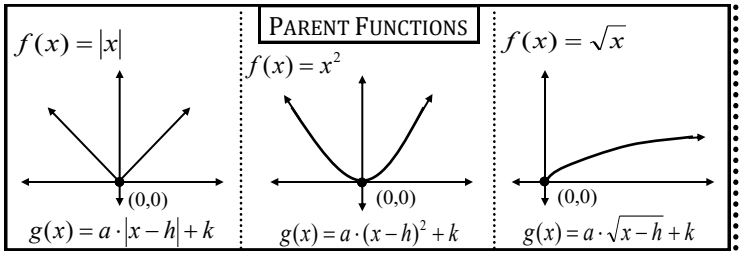
Domain: set of all possible inputs (x's)

Range: set of all possible outputs (y's)

* $f(x)$: means "f of x" ... same as y... NOT "f times x"

Transformation of Functions: $g(x) = a \cdot f(x-h) + k$

- h — horizontal shift in opposite direction ↔
- k — vertical shift in same direction ↕
- a = —1 — vertical reflection over x axis
- | a | > 1 — VERTICAL STRETCH
- | a | < 1 — VERTICAL COMPRESSION



Sequences

Arithmetic Sequence: (Generating each term by addition)

$$a_1, \overset{+d}{a_2}, \overset{+d}{a_3}, \ldots, a_{n-1}, a_n, a_{n+1}$$

1st term, 2nd term, 3rd term, 1 before nth term, "nth" term, 1 after nth term

Explicit Formula: $a_n = a_1 + d(n-1)$

Recursive Formula: $a_n = a_{n-1} + d$ or $a_{n+1} = a_n + d$

Geometric Sequence: (Generating each term by multiplication)

$$a_1, \overset{\cdot r}{a_2}, \overset{\cdot r}{a_3}, \ldots, a_{n-1}, a_n, a_{n+1}$$

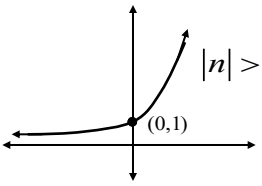
Explicit Formula: $a_n = a_1 \cdot r^{n-1}$

Recursive Formula: $a_n = a_1 \cdot r$ or $a_{n+1} = a_n \cdot r$

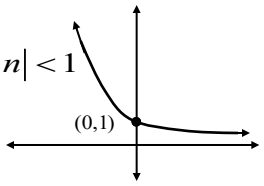
Exponential Functions

$f(x) = n^x$

Exponential Growth: $|n| > 1$

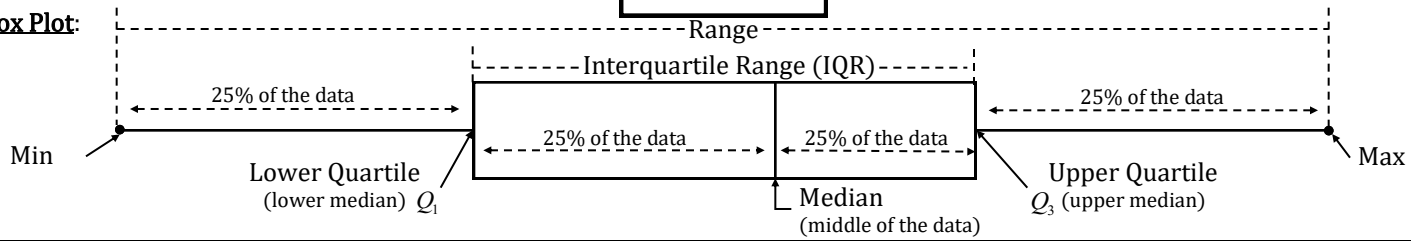


Exponential Decay: $|n| < 1$

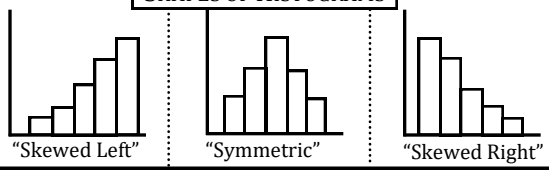


Statistics

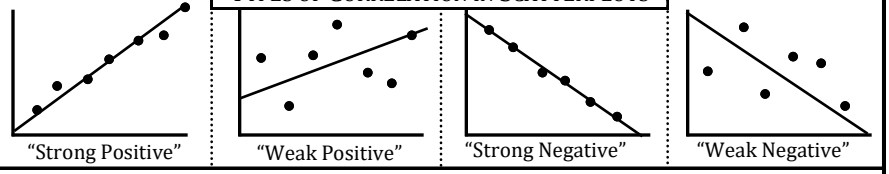
Box Plot:



Shapes of Histograms



Types of Correlation in Scatterplots



Correlation Coefficient (r): Tells how close a **best fit curve** is to the data in a **scatterplot** of **bivariate data** (2 variable) $-1 < r < 1$