

LINEAR EQUATIONS



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

Slope-Intercept Form:

$$y = mx + b$$

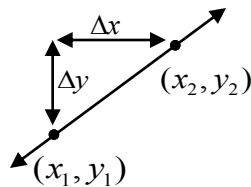
slope m y-intercept b

Point-Slope Form:

$$y - y_1 = m(x - x_1)$$

Slope Between 2 Points:

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



TYPES OF SLOPE			
Positive	Negative	Zero	Undefined

Parallel Slopes

$$m_{\parallel} = m$$

VS.

Perpendicular Slopes

$$m_{\perp} = -\frac{1}{m}$$

LINEAR INEQUALITIES			
$y > mx + b$	$y < mx + b$	$y \geq mx + b$	$y \leq mx + b$

QUADRATIC EQUATIONS



Standard Form:

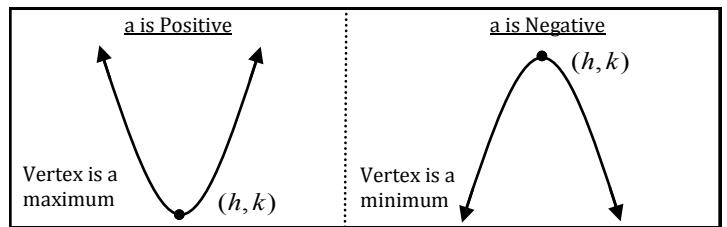
$$y = ax^2 + bx + c$$

Vertex Form:

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

Same Sign \rightarrow (h, k)
Opposite Sign \rightarrow (h, k)
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)

$$0 = (x - m)(x - n) \Leftrightarrow x = m \quad \& \quad x = n$$

* 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: $x^2 - m^2 = (x + m)(x - m)$

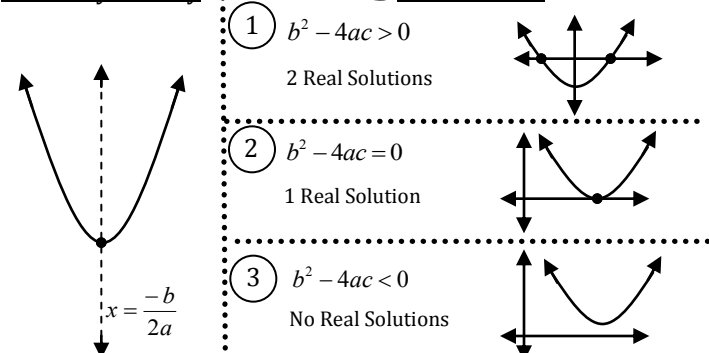
2) Completing the Square

$$x^2 + bx = c \iff \left(x + \frac{b}{2}\right)^2 = c + \left(\frac{b}{2}\right)^2$$

3) Quadratic Formula

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

Axis of Symmetry $x = -\frac{b}{2a}$ Discriminant $b^2 - 4ac$

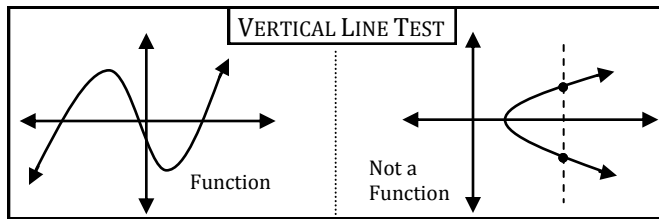


TYPES OF NUMBER

- **Natural #'s:** $\{1, 2, 3, \dots\}$
- **Whole #'s:** $\{0, 1, 2, 3, \dots\}$
- **Integers:** $\{\dots -3, -2, -1, 0, 1, 2, 3, \dots\}$
- **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

FUNCTIONS

Definition: only 1 output per input



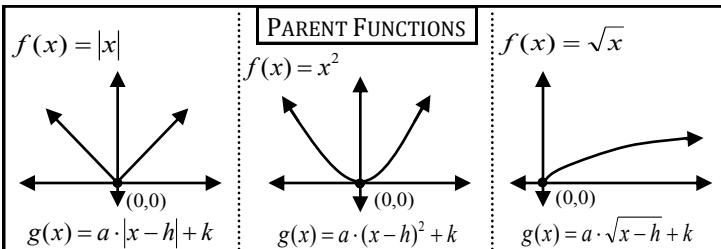
Domain: set of all possible inputs (x's)

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 \longleftrightarrow
- k vertical shift in same direction \updownarrow
- $a = -1$ vertical reflection over x axis
- $|a| > 1$ **VERTICAL STRETCH**
- $|a| < 1$ **VERTICAL COMPRESSION**



SEQUENCES

Arithmetic Sequence: (Generating each term by addition)

$$a_1, a_2, a_3, \dots, a_{n-1}, a_n, a_{n+1}$$

$\xrightarrow{+d}$ $\xrightarrow{+d}$

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)

$$a_1, a_2, a_3, \dots, a_{n-1}, a_n, a_{n+1}$$

$\xrightarrow{\cdot r}$ $\xrightarrow{\cdot r}$

Explicit Formula:

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

Recursive Formula:

$$a_n = a_1 \cdot r$$

or

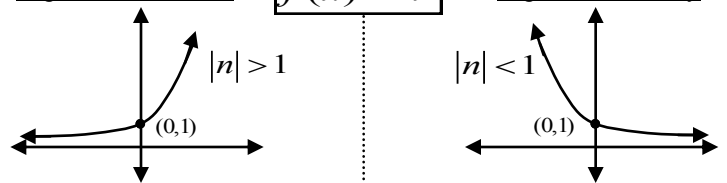
$$a_{n+1} = a_n \cdot r$$

EXPONENTIAL FUNCTIONS

Exponential Growth

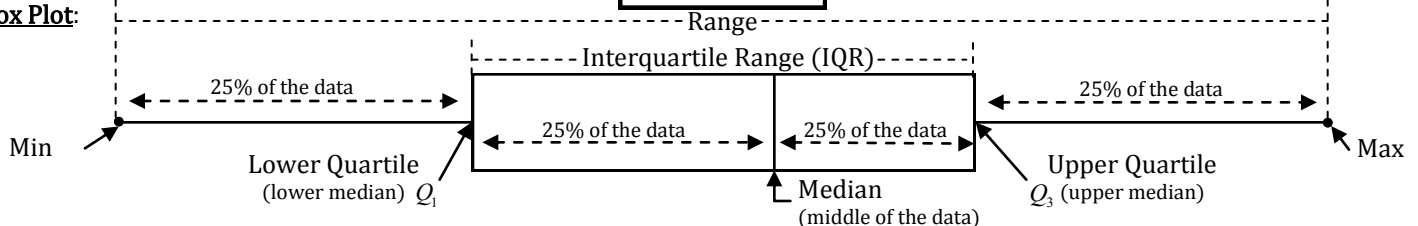
$$f(x) = n^x$$

Exponential Decay

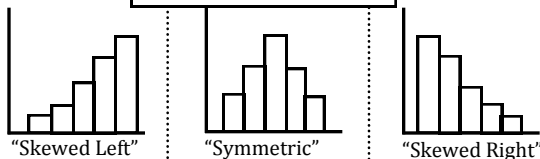


STATISTICS

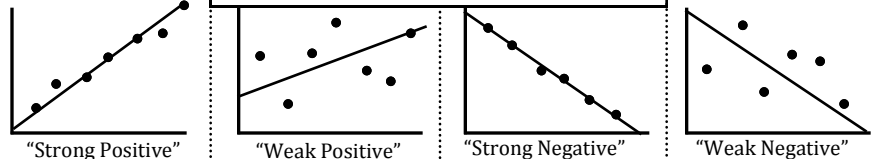
Box Plot:



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) $-1 < r < 1$