Source: KBhMATH401SubIndex

1 | First order difference

$\frac{\Delta y}{\Delta x}$ (Average slope of the function between two points)

When the first order difference > 0 — as x increases, f(x) *increases*

When first order difference > 0 — as x increases, f(x) *decreases*

2 | Second order differences

$\frac{\frac{\Delta y}{\Delta x}}{\Delta x}$ (The "acceleration" of the function)

This is related to the concavity of the graph!!

When the second order difference > 0 — the graph should be concave up

> "As soon as the yoyo is rolled, it is accelerating upwards. First, the acceleration works to slow the downwards velocity. Then, it actually flips the velocity up."

When first order difference > 0 — as x increases, f(x) *decreases*

> "As soon as the ball is tossed, it is accelerating downwards. First, the acceleration works to slow the upwards velocity. Then, it actually flips the velocity down."

3 | Linear Functions

- No change in slope
- And hence, 0 second order difference
- and so there is no concavity

4 | Log Functions

They are inverse to expotential functions.

Recall that, for the base graph $y = log(x)$:

1) Domain should be (0, ∞)
2) Range is (-∞, ∞)
3) As $x \to 0^+$, $y \to -\infty$
4) x-int at $y = 0$.

These, of course, are flipped for its sister, inverse function $y = 10^x$

1) Range should be (0, ∞)
2) Domain is (-∞, ∞)
3) As $x \to -\infty$, $y \to 0$
4) y-int at $x = 0$.