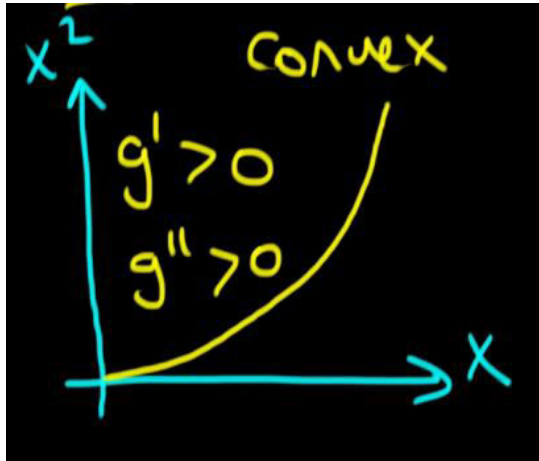


Convex Function - A function that is always curving upwards faster and faster

- The **first and second** derivatives are always positive



$$\varphi(\mathbb{E}[X]) \leq \mathbb{E}[\varphi(X)].$$

Jensen's Inequality - The expected value of $g(x)$ is always greater than or equal to g of the expected value $g[\mathbb{E}(X)]$, if g is a **convex** function

- The intuition is, if you take 4 points on the function, and find their COM, it will be above the (convex) function, i.e., higher than the value of f at $x = \text{average of those 4 points' } x$
 - This is because the **averaging of the input doesn't take into account the second derivative**.
- The reason why the value of expected input is different than the expected output, is that the value of expected input doesn't consider how much more higher the output of values higher than average are than the lower inputs' outputs are lower

