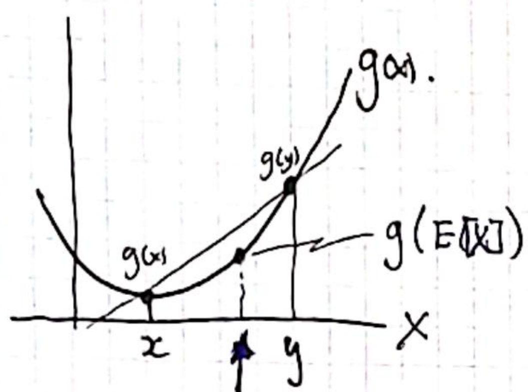
Def^n: A fcn in one variable is ~~so~~ convex if the line segment connecting any two pts. on the graph lie completely above the graph. ⑧

Convex Function:



$px+(1-p)y = E[X]$

- not a proof but. makes it easy to remember.
- say we have a pmf on the two values $X \sim x$ & y.

x $\bar{c}$ prob. p

y $\bar{c}$ prob. $q = 1-p$.

$\rightarrow \mathbb{E}[X] = px + qy$

- lies btwn x & y

$px+qy$ = convex comb^n of x & y. $= \mathbb{E}[X]$

- now look at $g(x)$ & $g(y)$.
- their convex sum = $pg(x) + qg(y)$ lies on the line connecting $(x,g(x))$ & $(y,g(y))$ in the graph.

$\rightarrow (x, g(x)) \longrightarrow (px, pg(x))$

$(y, g(y)) \longrightarrow (qy, qg(y))$ } convex comb^n $(px+qy, pg(x)+qg(y))$

$\qquad\qquad\qquad\qquad \mathbb{E}[X] \qquad \mathbb{E}[g(X)]$

~~note (px,~~

- by the def^n of a convex fcn the line connecting the two pts lies above the fcn.

$\therefore$ $\boxed{g(E[X]) \leq \mathbb{E}[g(X)]}$ for convex $g(x)$.

$\rightarrow$ generalizes to multiple varibles, discrete or cont's in the obvious way.

$\rightarrow$ called **Jensen's Inequality**.