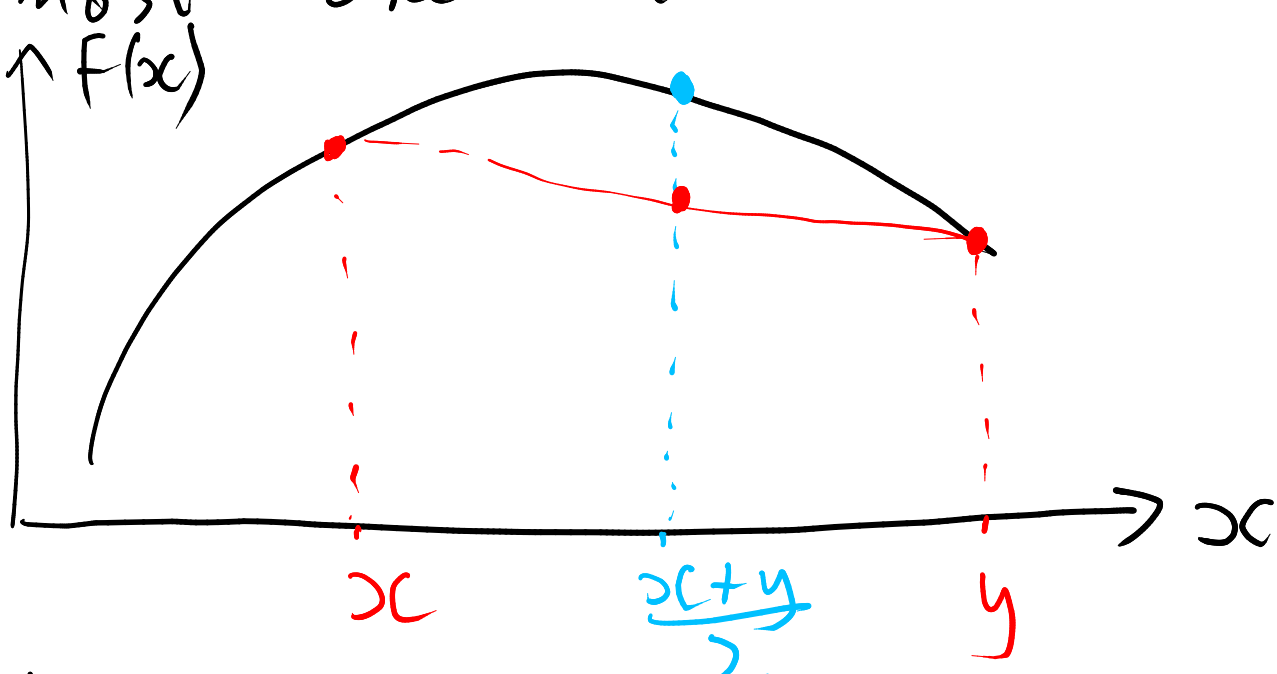
Theorem E4 If $g:\mathbb{R}\to\mathbb{R}$ is strictly increasing, then x^* maximises f if and only if x^* maximises $h(x) = g(f(x))$.

Proof Note that since g is strictly increasing, $f(x) \geq f(y)$ iff $g(f(x)) \geq g(f(y))$. Thus

x^* maximises f (see E1)
$\iff f(x^*) \geq f(x)$ for all $x \in X$
$\iff g(f(x^*)) \geq g(f(x))$ " " " "
$\iff h(x^*) \geq h(x)$ " " " "
$\iff x^*$ maximises h. □

E.5 If x^* maximises f, $Y \subseteq X$ and $x^* \in Y$, then x^* solves $\max_{y\in Y} f(y)$.

Theorem E1 Let $X \subseteq \mathbb{R}^n$. If $f: X \to \mathbb{R}$ is strictly concave, then f has at most one maximiser.



decreasing RTS

$$f(tx) \leq t f(x)$$

one restaurant — t restaurants