(3) Practice Problems

(1) Using the fact that for any two sequences $\{a_i\}_{i=1}^p$, $\{b_i\}_{i=1}^p$ we have that $\max_i(a_i + b_i) \leq \max_i a_i + \max_i b_i$, show that if $f_1, f_2, \ldots, f_p$ be convex functions, then $f(x) = \max_i f_i(x)$ is a convex function.

(2) Show that $f(x) = x \log x$ is a convex function for $x > 0$.

(3) Suppose S_1 and S_2 are convex sets, show that $S_1 + S_2$ is also a convex set.

(4) Show that a Euclidean ball, i.e., $B(x_c, r) = \{x \mid \|x - x_c\| \leq r\}$, is a convex set.