1. A function $u : \mathbb{R}^N_+ \to \mathbb{R}$ is quasiconcave if for all $x, y \in \mathbb{R}^N_+$ and all $\lambda \in [0, 1]$, $u(\lambda x + (1-\lambda)y) \geq \min\{u(x), u(y)\}$. Recall that a convex preference relation is represented by a quasiconcave function. Find a convex preference relation which cannot be represented by a *concave* utility function (this amounts to finding a quasiconcave function for which no strictly increasing transformation of it is concave).

2. Starr, Question 4.1

3. Starr, Question 5.2.

4. Show that if $K_1, \ldots, K_n$ are compact, then $\sum_{i=1}^n K_i$ is also compact. Find an example of a collection of sets $F_1, \ldots, F_n$ which are closed but whose Minkowski sum $\sum_{i=1}^n F_i$ is not closed (obviously at least one of them must be unbounded). Finally, use the latter part to show that upper hemicontinuity as we have defined it is not necessarily preserved under sums, but is preserved under sums if the image space is compact.

5. Starr, Question 6.1 (if we don’t go over the maximum theorem in class).