# Assignment 1 Hints

The following are some general hints for completing specified problems from Assignment 1.

## Problem 10

**Part c hint**: Note that in part **b** you prove that the indifference relation $\sim$ is an equivalence relation. The description of this relation is that if $x \sim y$ then $x \succsim y$ and $y \succsim x$ so $x$ is at least as good as $y$ and $y$ is at least as good as $x$ implying that a person with rational preferences is indifferent between the two bundles $x, y \in C$.

From the reading you hopefully learned that equivalence relations lead to **equivalence classes**. An equivalence class, in this case, is defined as a set $[x] = \{y \in C : x \sim y\}$ of bundles that a person would be completely indifferent between (they're equivalent in terms of preference). Essentially, this is an indifference curve. The set of all such equivalence classes generated by the indifference relation $\sim$, is going to be the *quotient set*. Use the set builder notation to express this set and then prove that it satisfies the definition of a partition (which you learned about in earlier reading on sets).

**Part d hint**: I have given you, in the previous hint, the interpretation of the quotient set generated by $\sim$. Before the start of the problem I have given you the necessary definitions for a relation to be a partial order. Partial orders on a set, order the elements in some sense giving a generalized notion of less than and greater than. Using the set of all equivalence classes (the quotient set) how do the elements in one equivalence class relate to the elements of another equivalence class under the relation $\succsim$? If we let $[x] = \{y \in C : y \sim x\}$ be a particular indifference curve then every element of this set would have the same "preference value" and would all compare to other bundles outside of $[x]$ the same way. Your job for the last part is to show that the rational preference relation $\succsim$ fulfills the definition of a partial order on the quotient set ( set of all indifference curves).

## Problem 13

Problem 13 is going to have a lot of similarities with problem 10. Let $A$ and $B$ be two nonempty sets and let $f : A \rightarrow B$. As you have learned we can define an inverse image, or pre-image for a given point $b \in B$, or more precisely $f^{-1}(b) = \{a \in A : f(a) = b\}$. We can define a relation, $\sim_f$ that says two elements $a, a' \in A$ are related under $\sim_f$ if $f(a) = f(a') = b$. You then need to prove that this relation $\sim_f$ is an equivalence relation and then the other results in parts **b** and **c**.