1. Let $S = \{ f \mid f : \mathbb{R} \to \mathbb{R} \}$. So, $S$ is the set of all functions on the real numbers. We define a relation $\subseteq$ on $S$ by:

$$f \subseteq g \iff \forall x \in \mathbb{R} : f(x) \leq g(x)$$

(a) Prove that the relation $\subseteq$ is reflexive. \hspace{1cm} (20)

(b) Prove that the relation $\subseteq$ is antisymmetric. \hspace{1cm} (40)

(c) Prove that the relation $\subseteq$ is transitive. \hspace{1cm} (40)

(d) **Bonus:** Is $(S, \subseteq)$ a totally ordered set? Justify your answer.