Order relations

Question 1 [5 points]
Give the definition of a total order.

A total order is a partial order with respect to which every pair of elements is comparable.

Question 2 [5 points]
Give the definition of a minimal element.

Let $A$ be a set, let $R$ be a partial order on $A$, let $B \subseteq A$, and let $x \in A$. We say that $x$ is a minimal element of $B$ if $x \in B$ and $\forall y \in B, x R y$. 

PLEASE TURN OVER
Functions

Question 3 [5 points]
Give the definition of right-uniqueness.

A relation $R$ between a set $A$ and a set $B$ is right-unique if $\forall x \in A, \forall y, z \in B$, $(x R y \land y R x) \Rightarrow y = z$.

Question 4 [5 points]
Give the definition of a function.

A function is a relation which is left-total and right-unique.

PLEASE TURN OVER.
Images and pre-images

Question 5 [5 points]
Let $A, B$ be sets, let $f: A \rightarrow B$ be a function, and let $S \subseteq A$. Give the definition of the image of $S$ under $f$.

The image of $S$ under $f$ is $\text{Im}_f(S) = \{y \in B \mid \exists x \in A. f(x) = y\}$. 