1. Give a rationale and/or proof for the following statements.

   (a) If A is countably infinite and $B \subseteq A$, then B is countable.

   (b) If A and B are both countably infinite, then $A \cup B$ is countably infinite.

   (c) If A and B are both countably infinite, then $A \times B$ is countably infinite.

(d) If $A_1, A_2, \ldots A_k$ is a set of k countably infinite sets, then

i. $A_1 \cup A_2 \cup \ldots \cup A_k$ is countably infinite.

ii. $A_1 \times A_2 \times \ldots \times A_k$ is countably infinite.

2. Match the statements on the left with an equivalent statement on the right for sets A and B and function $f : A \to B$.

$\lvert A\rvert = \lvert B\rvert$	f is injective but not surjective
	f is surjective but not injective
$\lvert A\rvert \leq \lvert B\rvert$	f is surjective and injective
	f is neither surjective nor injective
$\lvert A\rvert < \lvert B\rvert$	f is injective
	f is surjective