1. If $A \subseteq B$, then $x \in A$ implies $x \in B$, whence $x \in A \cap B$, so that $A \subseteq A \cap B \subseteq A$. Thus, if $A \subseteq B$, then $A = A \cap B$.

   Conversely, if $A = A \cap B$, then $x \in A$ implies $x \in A \cap B$, whence $x \in B$. Thus if $A = A \cap B$, then $A \subseteq B$.

8. (a) $f(E) = \{1/x^2 : 1 \leq x \leq 2\} = \{y : \frac{1}{4} \leq y \leq 1\} = [\frac{1}{4}, 1]$.

   (b) $f^{-1}(G) = \{x : 1 \leq 1/x^2 \leq 4\} = \{x : \frac{1}{4} \leq x^2 \leq 1\} = [-1, -\frac{1}{2}] \cup [\frac{1}{2}, 1]$.

11. $E \setminus F = \{x : -1 \leq x < 0\}$, $f(E) \setminus f(F)$ is empty, and $f(E \setminus F) = \{y : 0 < y \leq 1\}$.

13. If $x \in f^{-1}(G) \cap f^{-1}(H)$, then $x \in f^{-1}(G)$ and $x \in f^{-1}(H)$, so that $f(x) \in G$ and $f(x) \in H$. Then $f(x) \in G \cap H$, and hence $x \in f^{-1}(G \cap H)$. This shows that $f^{-1}(G) \cap f^{-1}(H) \subseteq f^{-1}(G \cap H)$. The opposite inclusion is shown in Example 1.1.8(b). The proof for unions is similar.