6.1) If f^{-1} is not injective, then there must be at least one x that is mapped to two or more y, which is false. If f^{-1} is not surjective, then there must be at least one x that is not mapped to every y. Since f^{-1} is both injective and surjective, it is bijection.

6.3a) Since r is an injective function from A to B, then there must be at least m distinct elements in B mapped to elements in A, $n >= m$. So r must be surjective.

6.3b) Let $A = k^2$ and $B = k+1$. The square root of an element A maps to an element in b, so A to B is injective. However, set B contains non-perfect squares that do not exist in A, so the map from A to B is not surjective.

6.5) In order to form a map f^{-1} from a subset of B to A, f must be injective. In order to map elements in A to elements in C, A must equal to D, and g is bijective. This can be expressed as $g^{-1}(f^{-1(B')})$, where B' is a subset of B.

6.7)

$$f^{-1}(n) = \frac{1}{2}n$$

$$g^{-1}(n) = \frac{n-1}{2}$$

$$\begin{aligned} h(n) &= g^{-1}(f^{-1}(n)) \\ &= g^{-1}(\frac{1}{2}n) \\ &= \frac{\frac{1}{2}n - 1}{2} \\ &= \frac{n-2}{4} \end{aligned}$$