10. a) true  b) true  c) false—see part (a)  d) true
   e) true—the one element in the set on the left is an element of the set on the right, and the sets are not eq
   f) true—similar to part (e)  g) false—the two sets are equal

17) Show that \( [A \subseteq B \text{ and } B \subseteq C \Rightarrow A \subseteq C] \)

   proof: let \( x \in A \) now since \( A \subseteq B \) then \( x \in B \)

   \( x \in B \) now since \( B \subseteq C \) then \( x \in C \)

   Hence \( A \subseteq C \)

46. a) If \( S \in S \), then by the defining condition for \( S \) we conclude that \( S \notin S \), a contradiction.
   
   b) If \( S \notin S \), then by the defining condition for \( S \) we conclude that it is not the case that \( S \notin S \) (otherwise \( S \) would be an element of \( S \)), again a contradiction.

2. a) This is not a function because the rule is not well-defined. We do not know whether \( f(3) = 3 \) or \( f(3) = -3 \).
   
   For a function, it cannot be both at the same time.
   
   b) This is a function. For all integers \( n \), \( \sqrt{n^2 + 1} \) is a well-defined real number.
   
   c) This is not a function with domain \( \mathbb{Z} \), since for \( n = 2 \) (and also for \( n = -2 \)) the value of \( f(n) \) is not defined by the given rule. In other words, \( f(2) \) and \( f(-2) \) are not specified since division by 0 makes no sense.
12. a) This is one-to-one, since if \( n_1 - 1 = n_2 - 1 \), then \( n_1 = n_2 \).

   b) This is not one-to-one, since, for example, \( f(3) = f(-3) = 10 \).

   c) This is one-to-one, since if \( n_1^2 = n_2^2 \), then \( n_1 = n_2 \) (take the cube root of each side).

   d) This is not one-to-one, since, for example, \( f(3) = f(4) = 2 \).

20. a) \( f(n) = n + 17 \)  

   b) \( f(n) = \lfloor n/2 \rfloor \)

   c) We let \( f(n) = n - 1 \) for even values of \( n \), and \( f(n) = n + 1 \) for odd values of \( n \). Thus we have \( f(1) = 2 \), \( f(2) = 1 \), \( f(3) = 4 \), \( f(4) = 3 \), and so on. Note that this is just one function, even though its definition used two formulae, depending on the the parity of \( n \).

   d) \( f(n) = 17 \)