Problem

Let X and Y be sets, let A and B be any subsets of X, and let C and D be any subsets of Y. Determine which of the properties are true for all functions F from X to Y and which are false for at least one function F from X to Y. Justify your answers.

Exercise

For all subsets C and D of Y, if $C \subseteq D$, then

F-1$(C) \subseteq F$-1(D).

Step-by-step solution

Step 1 of 1

Let F be a mapping from set X to set Y, and let C and D be any subsets of Y.

That means, $C \subseteq Y$, and $D \subseteq Y$.

Assume that, $C \subseteq D$.

The objective is to determine whether the statement, $F^{-1}(C) \subseteq F^{-1}(D)$ is true or false.

Let x be any element in the inverse image $F^{-1}(C)$.

That means, $x \in F^{-1}(C)$.

By the definition of inverse image,

$F(x) \in C.$

Since,

$C \subseteq D$
$F(x) \in D$

Hence, by the definition of inverse image, $x \in F^{-1}(D)$.

Therefore, $F^{-1}(C) \subseteq F^{-1}(D)$.

Hence, the statement is true.