

Answer on Question #40792– Math - Linear Algebra

a) Which of the following functions are 1-1 and which are onto? Justify your answer.

i) $f : R \rightarrow R_0$ given by $f(x) = x^2$ where R_0 is the set of non-negative real numbers.

ii) $f : R \rightarrow R$ given by $f(x) = x^2 + x + 1$.

Solution:

The function is injective or 1 to 1 if every element of the function's codomain is the image of at most one element of its domain.

The function f from a set X to a set Y is surjective (or onto), or a surjection, if every element y in Y has a corresponding element x in X such that $f(x) = y$.

i) $f: R \rightarrow R_0$ given by $f(x) = x^2$

If $R_0 = R \setminus \{0\}$ then f is not onto because for $y = -2$ we can't find a x such that $f(x) = x^2$ and it is not 1 to 1, because $f(1) = f(-1) = 1$.

If $R_0 = [0; +\infty)$ then f is onto, because for every y in $[0; +\infty)$ exists $x = \sqrt{y}$ such that $y=f(x)$ and it is not 1 to 1, because $f(-1)=f(1)$.

ii) $f: R \rightarrow R$ given by $f(x) = x^2 + x + 1$

This function is not onto, because for $y = 0$ we can't find x such that $0 = x^2 + x + 1$. And it is not 1 to 1 because $f(1) = f(-2) = 3$.