

Answer on Question #77238 – Math – Discrete Mathematics

Question

1) Determine whether each function is one-to-one. The domain of each function is the set of all real numbers. If the function is not one-to-one, prove it. Also, determine whether f is onto the set of all real numbers. If f is not onto, prove it.

a)

$$f(x) = 6x - 9$$

Solution

The function is one-to-one because if $f(x_1) = f(x_2)$ then $x_1 = x_2$:

$$6x_1 - 9 = 6x_2 - 9 \Rightarrow x_1 = x_2$$

The function is onto because for every y there is x such that $f(x) = y$:

$$x = \frac{y + 9}{6}$$

b)

$$f(x) = 2x^3 - 4$$

Solution

The function is one-to-one because if $f(x_1) = f(x_2)$ then $x_1 = x_2$:

$$2x_1^3 - 4 = 2x_2^3 - 4 \Rightarrow x_1 = x_2$$

The function is onto because for every y there is x such that $f(x) = y$:

$$x = \sqrt[3]{\frac{y + 4}{2}}$$

Question

2) Let $A = \{1, 2, 3\}$, $B = \{p, q\}$ and $C = \{a, b\}$. Let $f: A \rightarrow B$ is $f = \{(1, p), (2, p), (3, q)\}$ and $g: B \rightarrow C$ is given by $\{(p, b), (q, b)\}$. Find $g \circ f$ and show it pictorially.

Solution

$$(g \circ f)(a) = g(f(a)); a \in A$$

$$f(1) = p; g(p) = b \Rightarrow (g \circ f)(1) = b$$

$$f(2) = p; g(p) = b \Rightarrow (g \circ f)(2) = b$$

$$f(3) = q; g(q) = b \Rightarrow (g \circ f)(3) = b$$

$$g \circ f: A \rightarrow C = \{(1, b), (2, b), (3, b)\}$$

