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Assignment VI: MTH 213, Fall 2017

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QUESTION 1. None of the following is a function. Make a change to the domain or to the co-domain so they become functions

(i) $f : R \to R$ such that $f(x) = \frac{x}{\sqrt{x-1}}$

(ii) $f : R \to [-1, 2]$ such that $f(x) = 3sin(2x)$

(iii) $f : R \to [2, 3]$ such that $f(x) = sin(2x) + 3$

(iv) $f : [0, 7] \to [0, 2]$ such that $f(x) = \sqrt{x}$

QUESTION 2. Which of the following functions is (are) a 1-1 or onto or bijective or neither 1-1 nor onto

(i) Let $A = \{1, 4, 0, 6\}$ and $f : P(A) \to \{0, 1, 2, 3, 4\}$ such that $f(a) = |a|$ (where $|a|$ means the cardinality of a.)

(ii) Let $A = \{1, 4, 0, 6\}$ and $f : P(A) \to \{0, 1, 2, 3, 4, 5\}$ such that $f(a) = |a|$ (where $|a|$ means the cardinality of a.)

(iii) Let $f : [-2, \infty) \to [0, \infty]$ such that $f(a) = a^2$

(iv) Let $f : (-\infty, 0) \to (0, \infty]$ such that $f(a) = \frac{1}{a-1}$

(v) $f : R \to [2, 4]$ such that $f(x) = sin(2x) + 3$

QUESTION 3. Let W be the universal set where $W = \{2, \{2\}, \{3, 4\}, e, r, 3, 4\}$. Given $A = \{2, 3, r\}$, $B = \{\{3, 4\}, r, 2\}$

(i) Find A'

(ii) Find $A \cap B'$

(iii) Find $A - B$

(iv) Find $(A \cap B)'$

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Q1) (i) $(1, \infty) \longrightarrow (2, \infty)$

minimum codomain is [-3, 3]. Any interval contains [-3, 3] will do, for example [-3, 100) will do too, but [-2, 7) will not

(ii) $(-\infty, +\infty) \longrightarrow [-3, 3]$

Minimum codomain [2, 4] but any interval contains [2, 4] will do.

(iii) $(-\infty, +\infty) \longrightarrow [2, 4]$

Minimum codomain is [0, infinity) any interval contains [0, infinity) will do. For example (-infinity, infinity) will do

(iv) $[0, +\infty] \longrightarrow [0, +\infty]$

Q2) (i) Note elements of P(A) are subsets of A, so if a is in P(A), then |a| = 0 (if a = phi), or |a| = 1 or 2, or 3, or 4. Range = co-domain. Hence f is ONTO but not one to one, for let a = {1}, b = {6}. Then a and b in P(A) and f(a) = f(b) = 1 but a not = b

(ii) Neither

By (i) f is not onto since 5 in the codomain but 5 is not in the range. Also f is not 1-1 by (i)

(iii) Note, typos error I meant (0, infinity). it is Onto but not 1-1.

(iv) Wrong question. It is not a function. I meant codomain = [-1, 0). It is bijective if codomain [-1, 0).

(v) It is ONTO but not 1-1

Q3) $W = \{2, \{2\}, \{3,4\}, e, r, 3, 4\}$

$A = \{2, 3, r\}$, $B = \{\{3,4\}, r, 2\}$

i) $A' = W - A = \{\{2\}, \{3,4\}, e, 4\}$

ii) $A \cap B' \rightarrow B' = W - B = \{\{2\}, e, 3, 4\}$

$A \cap B' = \{3\}$

iii) $A - B = \{3\}$

iv) $(A \cap B)' = A' \cup B' = \{\{2\}, \{3,4\}, e, 4, 3\}$