BRAC UNIVERSITY

CSE230

Discrete Mathematics

Assignment 1

Student Information:

Name: Md. Danial Islam ID: 20101534
Section: 02

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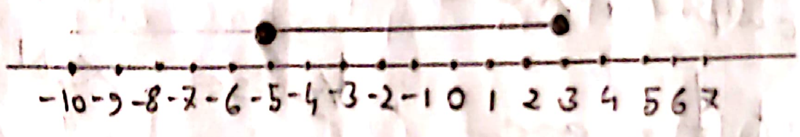
Assignment 1

1. $(-10,3] \cap [-5,5)$

$\Rightarrow \{x : x \in R, \cancel{x \in} -10 < x \leq 3 \text{ and } -5 \leq x < 5\}$



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2. $A = \{1, 3, 5\}$

$B = \{red, green\}$

$P(A) = \{\{1\}, \{3\}, \{5\}, \{1,3\}, \{1,5\}, \{3,5\}, \{1,3,5\}, \{\ \}\}$

$|P(A)| = 8$

$P(B) = \{\{red\}, \{green\}, \{red, green\}, \{\ \}\}$

$|P(B)| = 4$

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$A \times B = \{1, 3, 5\} \times \{red, green\}$

$= \{(1, red), (1, green), (3, red), (3, green),$

$(5, red), (5, green)\}$

$|A \times B| = 6$

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3) $A' \cap B' = (A \cup B)$

let, $x = \cancel{(A \cup} (A' \cap B')$ and, $y = (A \cup B)'$

now,

let, $p \in A' \cap B'$

$\Rightarrow p \in A'$ and $p \in B'$

$\Rightarrow p \notin A$ and $p \notin B$

$\Rightarrow p \notin (A \cup B)$

$\Rightarrow p \in (A \cup B)'$

$\cancel{\therefore y \subseteq x}$ $\therefore x \subseteq y$

again,

let,

$p \in (A \cup B)'$

$\Rightarrow p \notin (A \cup B)$

$\Rightarrow p \notin A$ and $p \notin B$

$\Rightarrow p \in A'$ and $p \in B'$

$\Rightarrow p \in (A' \cap B')$

$\therefore y \subseteq x$

$\therefore x = y$ and. $A' \cap B' = (A \cup B)'$

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4 let

Total: ~~n(I U~~ $n(T) = 105$

India visited people $n(I) = 50$

Nepal visited people $n(N) = 30$

Bhutan visited people $n(B) = 20$

Both India and Nepal $n(I \cap N) = 6$

Both India and Bhutan $n(I \cap B) = 1$

Both Nepal and Bhutan $n(N \cap B) = 5$

all three countries $n(I \cap N \cap B) = 1$

~~$n(I_0) = n(1)$~~

~~$n(A \cup$~~

$$n(I \cup N \cup B) = n(I) + n(N) + n(B) - n(I \cap N) - n(I \cap B) - n(N \cap B) + n(I \cap N \cap B)$$

$$= 50 + 30 + 20 - 6 - 1 - 5 + 1$$

$$\Rightarrow 89$$

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The number of ~~visitors~~ travelers that did not visit any of these countries

$n(T) - n(I \cup N \cup B)$

$\Rightarrow 105 - 89$

$\therefore n((I \cup N \cup B)') = 16$

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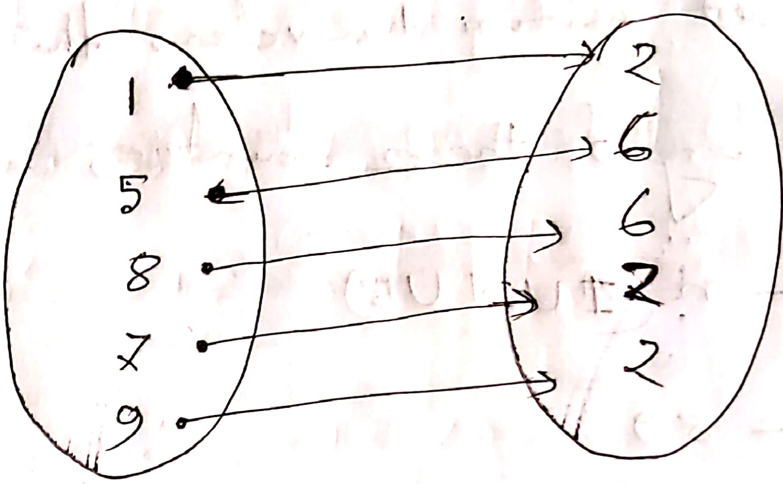
5. Given,

$\{(1,2),(5,6),(8,6),(7,2),(9,2),(8,6)\}$

as there ~~are~~ no such elements for which same 1st element of the ~~tuple~~ tuple ~~and~~ connected with different second element of the tuple so, the relation is a function.



6. $f(x) = \cos(4x-1)$

let, $y = \cos(4x-1)$

$\Rightarrow \cos^{-1} y = 4x - 1$

$\Rightarrow x = \dfrac{\cos^{-1} y + 1}{4}$

$\therefore f^{-1}(y) = \dfrac{\cos^{-1} y + 1}{4}$

$\therefore f^{-1}(x) = \dfrac{\cos^{-1}(x) + 1}{4}$

$\therefore$ Dom $f^{-1}(x) = [-1, 1]$

$\therefore$ Range $f(x) = [-1, 1]$

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and, ~~Dof~~

Dom, $f(x) = \mathbb{R}$.

7) $f(x) = \log(x^2 - 3)$

the ~~logarith~~ logarithmic function is defined only when the input is positive, so the function is defined when $x^2 - 3 > 0$

so, $x^2 - 3 > 0$

$\Rightarrow x^2 > 3$

$\Rightarrow x > \sqrt{3}$ ~~and~~ or $x < -\sqrt{3}$

The domain of $f(x) = \log(x^2 - 3)$ is

$\{x : x \in \mathbb{R},\ x > \sqrt{3},\ x < -\sqrt{3}\}$

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8) $f(x) = \frac{x-2}{x^2-8x+8}$

for $f(x)$ to be real the denominator

x^2-8x+8 must not be equal to zero

$x^2-8x+8 \neq 0$

$\Rightarrow \cancel{x^2}$

$x = \frac{+8 \pm \sqrt{(-8)^2-4.1.8}}{2}$

$= \frac{8 \pm \sqrt{64-32}}{2}$

$= \frac{8 \pm \sqrt{32}}{2}$

$\Rightarrow 4 \pm 2\sqrt{2}$

so, $x^2-8x+8 = 0$ gives $x = 4 \pm 2\sqrt{2}$

the given domain is not connect, connect

one is $(-\infty, 4-2\sqrt{2}) \cup (4-2\sqrt{2}, 4+2\sqrt{2}) \cup (4+2\sqrt{2}, +\infty)$

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9. Let the pairs are (x_1, x_2), (y_1, y_2) and (z_1, z_2)

We can arrange them in 2 rows as they are only in 2nd and 3rd rows.

$$\begin{matrix} x_1 & y_1 & z_1 \\ z_2 & x_2 & y_2 \end{matrix}$$

Also only 3 people can exchang them seats.

Total Arrangment is $\Rightarrow 2 \times 2^3 \times 3!$

$\Rightarrow 96$

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11)

as to be divisible by five the last number must be 0 or 5.

without considering 6 as a digit we get the arrangement

$$8 \times 9 \times 9 \times 9 \times 2 = 11664$$

and considering 6 as a digit we get the arrangement

$$9 \times 10 \times 10 \times 10 \times 2 = 18000$$

So, the number of arrangement of 5 digit integers which have at least 6 as a digit and divisible by 5 are $(18000 - 11664) = 6336$

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12. In circular arrangement the total numbers of arrangements are $(n-1)!$

in the Arrangement No two of A, B and C can't sit together.

without A, B and C total arrangement will be $(4-1)! = 6$

Now to not sit A, B and C together there will be four spaces between other 4 people.

So, $^4C_3 = 4$ ways to do the arrangement.

also we can again arrange these people in $3!$ ways.

So, total ways are $\rightarrow 6 \times 4 \times 6 = 144.$

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