Worksheet 2 Review

April 10, 2020

Question 1

a. One example is $x =$ Aizah and $y =$ Aizah.

There are more than one possible answer. The following examples also show truthiness of the statement.

- $x =$ Carlos and $y =$ Carlos
- $x =$ Ellen and $y =$ Ellen

b. One example is $x =$ Betty and $y =$ Aizah.

There are more than one possible answer. The following examples also show also show truthiness of the statement.

Part 1 ($\neg Rich(x)$ - True, $\neg SameDept(x, y)$ - False):

- $x =$ Betty, $y =$ Betty
- $x =$ Betty, $y =$ Doug
- $x =$ Doug, $y =$ Aizah
- $x =$ Doug, $y =$ Betty
- $x =$ Doug, $y =$ Doug
- $x =$ Flo, $y =$ Ellen
- $x =$ Flo, $y =$ Flo

Part 2 ($\neg Rich(x)$ - False, $\neg SameDept(x, y)$ - True):

- $x =$ Aizah, $y =$ Carlos
- $x =$ Aizah, $y =$ Ellen
- $x =$ Aizah, $y =$ Flo
- $x =$ Carlos, $y =$ Aizah
- $x =$ Carlos, $y =$ Betty
- $x =$ Carlos, $y =$ Doug
- $x =$ Carlos, $y =$ Ellen
- $x =$ Carlos, $y =$ Flo
- $x =$ Ellen, $y =$ Aizah
- $x =$ Ellen, $y =$ Betty
- $x =$ Ellen, $y =$ Carlos
- $x =$ Ellen, $y =$ Doug

Part 3 ($\neg Rich(x)$ - True, $\neg SameDept(x, y)$ - True):

- $x =$ Betty, $y =$ Carlos
- $x =$ Betty, $y =$ Ellen
- $x =$ Betty, $y =$ Flo
- $x =$ Doug, $y =$ Carlos
- $x =$ Doug, $y =$ Ellen
- $x =$ Doug, $y =$ Flo
- $x =$ Flo, $y =$ Aizh
- $x =$ Flo, $y =$ Betty
- $x =$ Flo, $y =$ Carlos

c. This statement is true. This is because in each department there is an individual who is rich. For example, in sales, there is Aizah. In HR, there is Carlos. In design, there is Ellen. So, for every employee y, we can choose person who is rich in the same department.

d. Consider an example where y is not in the same department as x, say $x =$ Aizah and $y =$ Carlos. This sets the statement $Rich(x) \wedge SameDept(x, y)$ to false.

Notes:

- **Negation of Statement:** $\forall x, \exists y \in E, \neg Rich(x) \vee \neg SameDept(x, y)$
- In above negation, only y needs to be chosen.

Question 2

a. $f(x) = 10$, where $f : \mathbb{R} \to \mathbb{R}$

> **Correct Solution:**
>
> $\exists x \in \mathbb{R}$, $f(x) = 10$, where $f : \mathbb{R} \to \mathbb{R}$

b. $\forall y \in codomain(\mathbb{R})$, $\exists x \in domain(\mathbb{R})$, $f(x) = y$, where $f : \mathbb{R} \to \mathbb{R}$

> **Correct Solution:**
>
> $\forall y \in \mathbb{R}$, $\exists x \in \mathbb{R}$, $f(x) = y$, where $f : \mathbb{R} \to \mathbb{R}$

Notes:

- Noticed professor doesn't label sets using *codomain* or *domain*.

c. **Negation of Onto:** $\exists y \in \mathbb{R}, \forall x \in \mathbb{R}, f(x) \neq y$

A counter example of f not being onto is $y = -1$.

Question 3

a. $\{n \mid n \in S, n > 1\}$

b. $P(n) : n > 3$