

HW8 (CSCI-C241)

Lillie Donato

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1. Question One

- (a) R_1 is not a function, because $R(1, 2)$ and $R(1, 3)$ but $2 \neq 3$
- (b) R_2 is a total function each member of A is related only to a single member of A
- (c) R_3 is a partial function, because each member of A is related to no more than one member of A , but not every member of A is related to another member.
- (d) P_2 is partial function because if $x, y, z \in \mathbb{R}$, $x \cdot y = 120$, and $x \cdot z = 120$, then $x = z$, but $\neg P_2(0, n)$ where $n \in \mathbb{R}$
- (e) P_3 is a total function because if $x, y, z \in \mathbb{R}^*$, $x \cdot y = 120$, and $x \cdot z = 120$, then $x = z$, and for every $n \in \mathbb{R}^*$, there is some $n_2 \in \mathbb{R}^*$ where $n * n_2 = 120$

2. Question Two

- (a) f_1 is not one-to-one, because $f_1(a) = f_1(d)$ but $a \neq d$
- (b) f_1 is not onto because there is no $x \in B$ where $f_1(x) = a$
- (c) f_2 is one-to-one because there is no $x, y \in B$ where $f_2(x) = f_2(y)$ and $x \neq y$
- (d) f_2 is onto because for every member of the codomain, there is some member of the domain that maps to said member of the codomain
- (e) s_1 is not one-to-one because $s_1(10) = s_1(-10)$ but $10 \neq -10$
- (f) s_2 is one-to-one because if a $x \in [0, \infty)$ and $x^2 - 10 = n$ where $n \in [0, \infty)$, there is no other member of the domain that can be squared and have ten added to equal n
- (g) s_2 - onto?
- (h) c_1 - one-to-one?
- (i) c_1 - onto?
- (j) c_2 - onto?
- (k) d is a total function, because for any possible string (including the empty string), there exists a string that contains dashes in between each character
- (l) d is one-to-one, because for any two strings, if they have dashes inserted in between their characters, the resulting strings for each would never be the same
- (m) d is not onto, because there exists no $s \in \text{Str}$ where $d(s) = \text{wall}$
- (n) f is a partial function, because for any $s \in \text{Str}$, there is only one possible first character of that string, but there does not exist $s_2 \in \text{Str}$ such that $f(\text{""}) = s_2$
- (o) f is not one-to-one, because $f(\text{car}) = f(\text{can})$ but $\text{car} \neq \text{can}$

3. Question Three

- (a) Part (a)
- (b) Part (b)
- (c) Part (c)
- (d) Part (d)
- (e) Part (e)
- (f) Part (f)
- (g) Part (g)

- (h) Part (h)
- (i) Part (i)
- (j) Part (j)
- (k) Part (k)
- (l) Part (l)
- (m) Part (m)
- (n) Part (n)

4. Question Four

- (a) Part (a)
- (b) Part (b)

Proof.

(1)

□

5. Question Five

- (a) Part (a)
- (b) Part (b)

6. Question Six

- (a) Part (a)
- (b) Part (b)

Proof.

(1)

□

7. Question Seven

- (a) Part (a)

Proof.

(1)

□