HW15b - 3.24

Tuesday, March 21, 2023 9:28 PM

5. Classify each of the following as a total function, a partial function, or not a function.

a) $f = \{(1, a)\}$ for domain space $\{1\}$ and range space $\{a, b\}$.

a)

Total

All domain is used

b) $f(x) = 1/x$ when both domain and range space are the **R**eal numbers (**R**).

b)

Partial

at x = 0, y is undefined

c) $f(x) = \sin(x)$ when domain space is the **N**atural numbers (**N**, the positive integers) and range space is **R.**

c)

Total

All domain is used

d) $f(x) = x^{½}$ when both domain and range space are **R**. (Recall that the square root of a positive number n is $\pm n$.)

d)

Not a function

A single x can return 2 y's.
If we only accept positive values, which is common with root operations, then it would be partial, because not all domain is used, since it starts at x = 0.

e) $f(x, y) = \max(x, y)$ for domain space $\mathbf{R} \times \mathbf{R}$ and range space **R.**

e)

Total

x and y aren't indicating input and output, they're both input variables.

f) $f = \{((1, 1), a), ((2, 1), b), ((1, 2), b)\}$ for domain space $\{1, 2\} \times \{1, 2\}$ and range space $\{a, b\}$.

f)

Partial

Unused domain values exist

{ (1,1), (1,2), (2,1), (2,2) } on {a,b}

g) $f = \{((1, 1), a), ((1, 1), b), ((1, 2), b)\}$ for domain space $\{1\} \times \{1, 2\}$ and range space $\{a, b\}$.

g)

Not a function

Domain value (1,1) is re-used

{ (1,1), (1,2), (2,1) } on {a,b}

7. Classify each of the following functions as: injection, surjection, bijection, or none. Give the most specific answer.

a) $f=\{(a, 1), (b, 2), (c, 2), (d, 3)\}$ for domain space $\{a, b, c, d\}$ and range space $\{1, 2, 3, 4\}$

b) $f=\{(a, 1), (b, 2), (d, 3), (c, 5)\}$ for domain space $\{a, b, c, d\}$ and range space $\{1, 2, 3, 4, 5\}$

c) $f=\{(a, 1), (b, 2), (c, 4), (d, 3)\}$ for domain space $\{a, b, c, d\}$ and range space $\{1, 2, 3, 4\}$

d) $f=\{(a, 1), (b, 2), (c, 4), (d, 3), (e, 1)\}$ for domain space $\{a, b, c, d, e\}$ and range space $\{1, 2, 3, 4\}$

e) $f(x) = \cos(x)$ when both domain and range space are **R**.

f) $f(x) = 3x+2$ when both domain and range space are **R**.

g) $f(x) = x^2+1$ when both domain and range space are positive **R**.

a)

None

missing 4, 2 was repeated

b)

Injection

missing 4, but no range value is repeated

c)

Bijection

d)

Surjection

1 was repeated

e)

None

Plenty of x's share a y so it's not Injection

Not all real values are used in Range, so it's not subjection.

f)

Bijection

No x's share a y, so it's Injection

All values in Range are used, so it's Subjection as well.

g)

None

Multiple x's share the same y, so it's not Injection

Positive values 0 through 1 are unused, so it's not Subjection