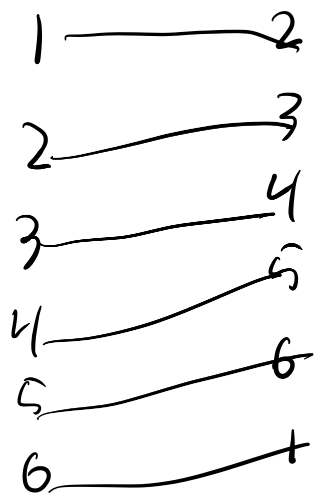
Bijective = both, surjective = onto, injective = one to one

1

A



$$\begin{array}{c|cccccc} & & & Y & & & \\ & 1 & 2 & 3 & 4 & 5 & 6 \\ \hline X\ 1 & & 1 & & & & \\ 2 & & & 1 & & & \\ 3 & & & & 1 & & \\ 4 & & & & & 1 & \\ 5 & & & & & & 1 \\ 6 & 1 & & & & & \end{array}$$

$$\boxed{S = \{(1,2),(2,3),(3,4),(4,5)(6,1)\}}$$

B

$S = \{(1,1),(2,1),(3,1),(4,1),(5,1),(6,1)\}$

C

$S = \{(1,1),(2,2),(3,3),(4,4),(5,5)\}$

$$\begin{array}{c|c} & 6 \\ 6 & \begin{bmatrix} 1 & & & & & \\ & 1 & & & & \\ & & 1 & & & \\ & & & 1 & & \\ & & & & 1 & \\ & & & & & 0 \end{bmatrix} \end{array}$$

D

$S = \{\{(1,1),(2,1),(2,2),(3,3),(3,4),(4,4),(5,5),(6,6)\}$

1

(a) Bijection $f: \mathbb{Z} \to \mathbb{Z}$ not $f(x) = x$

$$\left(\begin{array}{l} x = \text{some } \mathbb{Z} \\ y = x+1 \end{array} \right)$$

$$f = \{-\infty, (x, y), \infty+\}$$

my thinking is that since there are infinit whole numbers there will always be a larger and smaller number to compare to each other. If one number is selected for x then you have your y. Only problem is that in order for it to be "one to one" all of the set must be represented. Since it is infinite it can not be bijective. $\boxed{\text{no}}$ my best try is above.

(B)

x = randomly chosen x
y = " " y

f = (size infinity) $\{(x, y), (x, y), (x, y), (x, y) \ldots\}$

eventually will have a repeat, or so is probable to happen. Either way it can not be represented infinitly so one static function would immediatly be not one to one

as there are whole numbers that exist that are not in that static function. static meaning defined cardinality not infinity, a set number.

(C) x = some $\mathbb{Z}$

$y = x+1$

some y

new (x,y)

$f = \{(x,y), (x+1,y), (x,y), (x,y), \ldots\}$

if given bounds then I believe it might work. I am abit confused on relating an infinite quantity to something that needs definite cardinality.

If this is possible I believe you just need to follow pattern above and it would qualify as surjective. There wasn't much material on these infinite quantities so I could easily be mistaken, or I missed it.

(D) NO, can not contain infite quantity so there will always be a value not contained

(3) (A) $\log(120)$

(B) $\log(n!)$

4

A $\lfloor \pi + e \rfloor = 3 + 2 = \boxed{5}$

B $\lceil \sqrt{11} - e \rceil = 4 - 3 = \boxed{1}$

C $\text{int}(-7.04) = \boxed{-7}$

D $\text{frac}(-7.04) = \boxed{-0.04}$

5 Bonus Y

$$\begin{array}{c c} & \begin{array}{cccc} 1 & 2 & 3 & 4 \end{array} \\ \begin{array}{c} 1 \\ 2 \\ X\,3 \\ 4 \end{array} & \begin{bmatrix} 0 & 1 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix} \end{array} \circ =$$

$$\begin{matrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{matrix}$$

$$\circ \begin{bmatrix} 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 \end{bmatrix} = \begin{matrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 \\ 1 & 1 & 1 & 0 \end{matrix}$$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 0 & 0 \end{bmatrix} \circ \begin{bmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix} \circ \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$$

I did multiple examples to show that no matter the configuration if two surjective functions are formed in composition they will result in surjective.