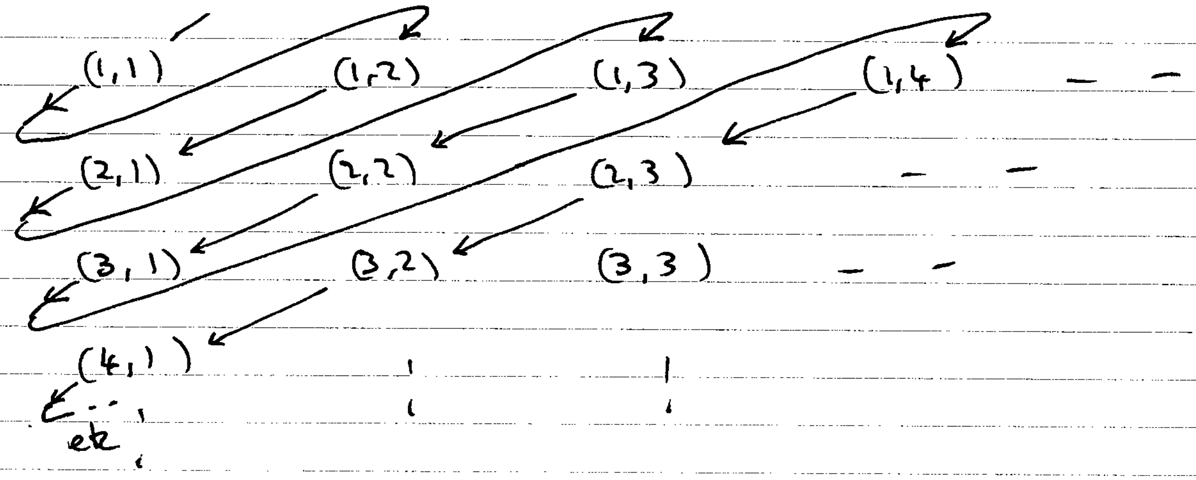
We saw in class that the bijection from $\mathbb{Z}^+ \times \mathbb{Z}^+$ to $\mathbb{Z}^+$ indicated by the diagram below



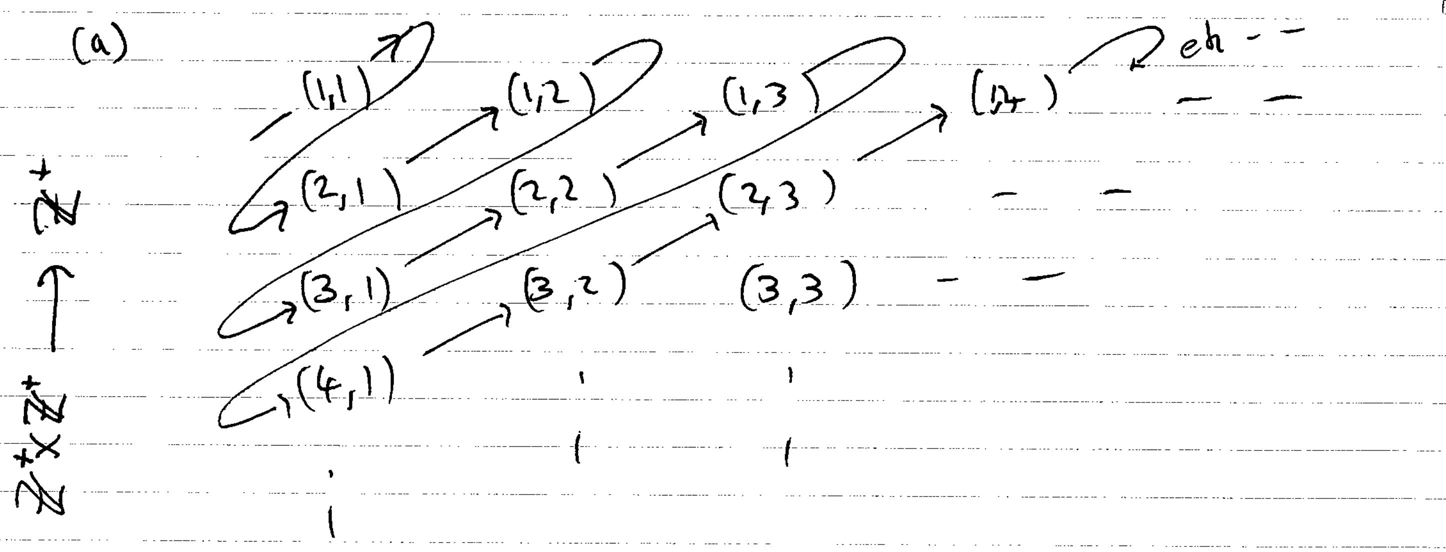
has the explicit form

$$f : \mathbb{Z}^+ \times \mathbb{Z}^+ \longrightarrow \mathbb{Z}^+$$

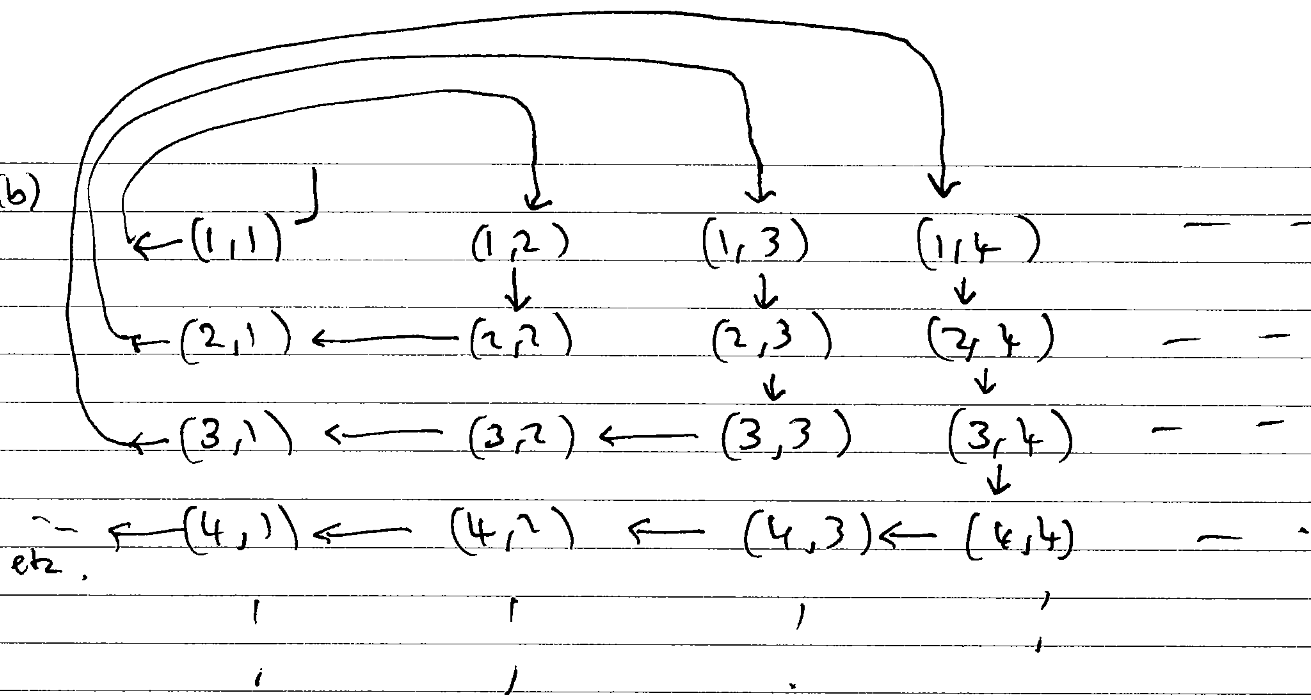
$$: (m, n) \longmapsto \frac{(n+m)(n+m-1)}{2} - n + 1$$

Q1 : Find an explicit form for the bijections described by the following diagrams

(a)



Q1(b)



Also $\mathbb{Z}^+ \times \mathbb{Z}^+ \longrightarrow \mathbb{Z}^+$

Q2 Say, giving reasons, whether each of the following sets ~~are~~ is countable OR uncountable.

$A = \{ f \mid f : \{0,1\} \to \mathbb{Z}^+ \text{ is a function} \}$

$B_n = \{ f \mid f : \{1, \dots, n\} \to \mathbb{Z}^+ \text{ is a function} \}$

$C = \bigcup_{n=1}^{\infty} B_n$

$D = \{ f \mid f : \mathbb{Z}^+ \to \mathbb{Z}^+ \text{ is a function} \}$

$E = \{ f \mid f : \mathbb{Z}^+ \to \{0,1\} \text{ is a function} \}$

$F = \{ f \mid f : \mathbb{Z}^+ \to \{0,1\} \text{ is a function which is eventually zero} \}$

Given f, $\exists M$ s.t. $f(n) = 0 \quad \forall n \geq M$

$G = \{ f \mid f : \mathbb{Z}^+ \to \mathbb{Z}^+ \text{ is an injective function} \}$.