2. Diagonalization

Suppose there is a List for all infinite binary sequences that are 1 in odd position

~~number~~ position	1	2	3	4	5	6	7	8	9	……
b_1	1	0	1	1	1	1	1	0	1	
b_2	1	0	1	0	1	1	1	1	1	
b_3	1	0	1	1	1	0	1	1	1	
b_4	1	1	1	1	1	1	1	1	1	
b_5	1	1	1	0	1	0	1	1	1	
b_6	1	0	1	0	1	1	1	0	1	
⋮										……

We use even position columns to form a second table

~~number~~ even position	2	4	6	8	……
b_1	$0 \to 1$	1	1	0	
b_2	0	$0 \to 1$	1	1	
b_3	0	1	$0 \to 1$	1	
b_4	1	1	1	$1 \to 0$	
⋮					……

using Flipping rule, let D to be an infinite binary #

if $b_n(2n) = 0$ set $D(2n) = 1$

if $b_n(2n) = 1$ set $D(2n) = 0$

and then set $D(2m+1) = 1$ where $m \geq 0, m \in \mathbb{Z}$

to make odd position of D to be all "1"

So D is a number that is in set B

For all n, we have $D(2n) \neq b_n(2n)$, therefore $D \neq b_n$ for any n in this List, so this List is Incomplete

$\Rightarrow$ thus.

$B: \{x : x$ is all infinite binary sequences that are 1 in odd positions$\}$ is uncountable