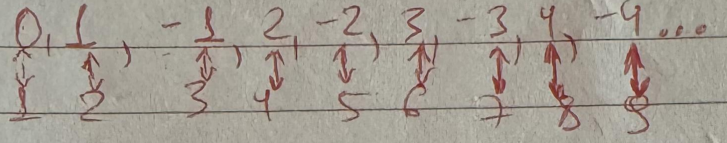
HW Minimal (2.5) Week 16.

Show that the set of all integers is countable.

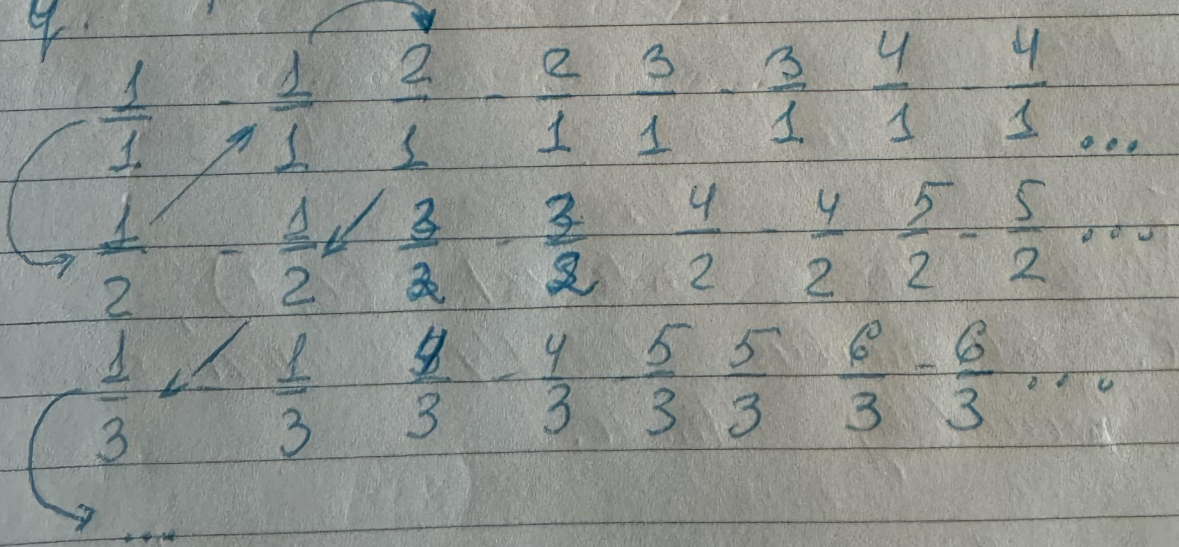


Prove that the set of all rational numbers (Q) is countable.

10^{100} - google

$10^{10^{100}}$ - google plex.

$\frac{p}{q}$ $q \neq 0$.



Exercise 35 er "Prove that the power set of a set of all natural numbers ($\mathbb{Z}^+$) is uncountable.

$P(\mathbb{Z}^+)$ is uncountable?

S: N N Y Y ... → New set

	1	2	3	4	5	6	7	8	9	10 ...
1 ↔	(Y)	N	Y	N	Y	N	Y	N	Y	N ...
2 ↔	N	(Y)	N	Y	N	Y	N	Y	N	Y ...
3 ↔	Y	Y	(N)	Y	Y	Y	Y	Y	Y	Y ...
4 ↔	N	N	Y	(N)	N	N	N	N	N	N ...
				O						
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Cantor diagonalization argument

$|S| < |P(S)|$

Solve a version of Hilbert's Hotel problem where an infinite buses with an infinite number of people show up.

Hotel	R1	R2	R3	R4	R5	R6 ...
Bus 1	B1S1	B1S2	B1S3	B1S4	B1S5	B1S6 ...
Bus 2	B2S1	B2S2	B2S3	B2S4	B2S5	B2S6 ...
Bus 3	B3S1	B3S2	B3S3	B3S4	B3S5	B4S6 ...
⋮						

R1 R2 B1S1 B2S1 B1S2 R3 R4 B1S3 B2S2 B3S1

Solve a version of Hilbert's Hotel problem where a single bus with an infinite number of people with infinitely long names consisting of A and B shows up.

Room1	(A) B B A A A A A A A A ...
Room2	B (A) A A A A A A ...
Room3	B A (B) A A A A A ...
Room4	B B A (B) A A A A ...
⋮	

No Room B B A A ... different from every name on list

That's mean The bus with infinitly long names bigger than Hilbert's Hotel.