1)	$0.0012\ldots$
2)	$0.5314\ldots$
3	$0.6027\ldots$

Create a new number of the form $0.a_1a_2\ldots a_i$

For the ith row, if the ith digit x_i after decimal pt. is 2, then $a_i = 3$, & $a_i = 2$ otherwise

---

Turing machines can accept, reject, or loop without halting on an input.

Undecidable problem : Halting problem.
Given the encoding for a Turing Machine M, and a string x, does M halt on x?

Suppose on the contrary, there is a TM M' that can decide the halting problem

M_i on S_j

	S_j			
	00	01	10	11
M_1	L_H	H	L	H
M_2	H	H_L	L	H
M_3	L	L	L_H	L
⋮				

TM N which may simulate M_i acting on S_j, using M'

When given an input S_j, it Computes the code for M_j, uses M' to find whether M_j will halt or loop on S_j. If M_j loops on S_j, N halts.
If M_j halts on S_j, N enters a loop.

Given a TM M.

Does M

a) have atleast 481 states? ✓ Just count the state from the encoding of M

b) take more than 481 steps on input ε? ✓ Simulate the working of M on ε

c) takes more than 481 steps on some input?
Run M on all inputs of length ≤ 481. if it take more than 481 steps on any of them then we are done. Otherwise, it cannot move beyond the initial 481 characters of any input and use more steps on it.

d) takes more than 481 steps on all input?
similar to above

e) ever moves its head more than 481 tape cells away from the left endmarker on input ε?