

COS 116
The Computational Universe
Homework 3

Email to pu.cos116@gmail.com by: noon Thurs March 8

Q1)

- a) Define the binary logarithm (denoted in class by $\log_2 n$).
- b) What is the binary logarithm of 42?
- c) Write a number whose binary logarithm is 5. How many such numbers are there?
- d) Give pseudocode to compute the binary logarithm. Assume the input is an integer stored in a variable called n . Your program has to print $\log_2 n$.
- e) Estimate the running time of your pseudocode.

Q2)

Based on the first two weeks' readings from Brooks's book, and your experience with Scribbler so far, write a paragraph describing **either** (a) or (b):

- a) Brooks's design of Genghis, and whether reading about it changed your perception about machine intelligence.
- b) Brook's vision of machines to live with, and how you feel about that vision.

Q3)

Try out one of the game of life simulators linked on the "handouts" tab of the course web page, and find a starting configuration that gives a "life" sequence that repeats over time.

Q4)

Write a Turing-Post program that prints the bit sequence 101 infinitely often, as well as its binary code.

Q5)

Try out Turing machine simulator linked on the "handouts" tab of the course web page, and try out the "subtractor." (Choose this one just to the right of the "load program" button and then click load program. Next click "start" in the upper left corner.) Use it to subtract 2 numbers (say 3, represented as 111 minus 2, represented as 11). Roughly how many steps does it take to subtract two numbers n minus m ?