

Assignment5

1. True or False (1pts, 0.5pts per question)

- T A) The class NP consists of those problems that are verifiable in polynomial time.
- F B) NP is the class of languages that are not decidable in polynomial time on a deterministic single-tape Turing machine.

2. How many characteristics does an algorithm have? What are they? (3pts)

3. How many algorithm representations have we learned? What are they? (2pts)

4. Ordering the following functions by order of growth. Please give the calculation process. (4 pts)

$(1.5)^n$

$\log(\log n)$

$2n$

$8n^3 + 17n^2$

$$\lim_{n \rightarrow \infty} \frac{8n^3 + 17n^2}{1.5^n} \stackrel{\text{L'Hopital}}{=} \lim_{n \rightarrow \infty} \frac{24n^2 + 34n}{\log(1.5) \cdot 1.5^n} \stackrel{\text{L'Hopital}}{=} \lim_{n \rightarrow \infty} \frac{48}{\log(1.5)^3 \cdot 1.5^n} = 0 \quad (1)$$

$$\lim_{n \rightarrow \infty} \frac{2n}{8n^3 + 17n^2} = \lim_{n \rightarrow \infty} \frac{2}{8n^2 + 17n} = 0 \quad (2)$$

$$\lim_{n \rightarrow \infty} \frac{\log(\log n)}{2n} \stackrel{\text{L'Hopital}}{=} \lim_{n \rightarrow \infty} \frac{\frac{1}{n \log n}}{2} = 0 \quad (3)$$

By [eq.1] we have $8n^3 + 17n^2 = o(1.5^n)$, by [eq.2] we have $2n = o(8n^3 + 17n^2)$, by [eq.3] we have $\log(\log n) = o(2n)$.

We therefore order these functions by order of growth as

$$\log(\log n) < 2n < 8n^3 + 17n^2 < (1.5)^n$$

2. (3 pts)

Four.

A goal as its computing object;

Has inputs;

Has a special ordered sequence of steps;

Has three basic control structures: sequence, conditional branch(decision) and loop(iteration).

Must halt

Has an output.

3. (2pts)

Three, Flowcharts; Primitives; Pseudo-code.