1.Prove the following properties of asymptotic notation:  
(a)𝑛 = 𝜔(√𝑛);  
(b) If 𝑓(𝑛) = Ω(𝑔(𝑛)), and h(𝑛) = Θ(𝑔(𝑛)), then 𝑓(𝑛) = Ω(h(𝑛)).  
(c) 𝑓(𝑛) = 𝑂(𝑔(𝑛)) 𝑖𝑓 𝑎𝑛𝑑 𝑜𝑛𝑙𝑦 𝑖𝑓 𝑔(𝑛) = 𝛺(𝑓(𝑛)) (*Transpose Symmetry* property)

2. Problem 3-2 in CLRS Text book.

Table

Description automatically generated

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | O | O | Omega | W | Θ |
| a | Yes | Yes | No | No | No |
| B | Yes | Yes | No | No | No |
| C | No | No | No | No | No |
| D | No | No | Yes | Yes | No |
| E | Yes | No | Yes | No | Yes |
| f | Yes | No | Yes | No | yes |

3. You have 5 algorithms, A1 took 𝑂(𝑛) steps, A2 took 𝛩(𝑛 𝑙𝑜𝑔 𝑛 ) steps, and A3 took 𝛺(𝑛) steps, A4 took 𝑂(𝑛3) steps, A5 took 𝑜(𝑛2) steps. You had been given the exact running time of each algorithm, but unfortunately you lost the record. In your messy desk you found the following formulas:  
(a) 4(5*2*log5𝑛)+6𝑛+9527

3  
(b) √3𝑛!

4log15 𝑛 2  
(c)( 6 ) +4𝑛+17

(d) 3𝑛𝑙𝑜𝑔2𝑛 + (𝑙𝑜𝑔2𝑛)2 (e)𝑙𝑜𝑔2𝑙𝑜𝑔2𝑛 +6  
(f) 23𝑙𝑜𝑔2𝑛

(g) (𝑙𝑜𝑔2𝑛)3 + 𝑙𝑜𝑔2𝑙𝑜𝑔2𝑛

Answers:

a)