

Santiago Dominguez Problem 3.1

a)

- i)  $f \in \Theta(g)$  Not true. The limit is 0 which isn't  $0 < \text{limit} < \text{infinity}$
- ii)  $f \in O(g)$  True for  $n \geq 1.342$ ,  $\lim f(n) / g(n) < \text{infinity}$
- iii)  $f \in o(g)$  True for  $n \geq 1.342$ ,  $\lim f(n) / g(n) = 0$
- iv)  $f \in \Omega(g)$  Not true. Limit isn't  $> 0$ .
- v)  $f \in \omega(g)$  Not true. Limit isn't infinity.
- vi)  $g \in \Theta(f)$  Not true. Limit isn't less than infinity and greater than 0.
- vii)  $g \in O(f)$  Not true. Limit isn't less than infinity.
- viii)  $g \in o(f)$  Not true. Limit isn't 0.
- ix)  $g \in \Omega(f)$  True for  $n \geq 1.342$ , Limit  $> 0$ .
- x)  $g \in \omega(f)$  True for  $n \geq 1.342$ , Limit is infinity.

b) F

- i)  $f \in \Theta(g)$  Not true. Limit isn't less than infinity and greater than 0.
- ii)  $f \in O(g)$  Not true. Limit is less than infinity.
- iii)  $f \in o(g)$  Not true. Limit isn't 0.
- iv)  $f \in \Omega(g)$  True for  $n > 0.415$ . Limit  $> 0$ .
- v)  $f \in \omega(g)$  True for  $n > 0.415$ . Limit is infinity.
- vi)  $g \in \Theta(f)$
- vii)  $g \in O(f)$
- viii)  $g \in o(f)$
- ix)  $g \in \Omega(f)$
- x)  $g \in \omega(f)$

c) A

- i)  $f \in \Theta(g)$  Not true. Limit isn't less than infinity and greater than 0
- ii)  $f \in O(g)$  Not true. Limit is less than infinity
- iii)  $f \in o(g)$  Not true. Limit isn't 0.
- iv)  $f \in \Omega(g)$  True for  $n > 0.29$ . Limit  $> 0$ .
- v)  $f \in \omega(g)$  True for  $n > 0.29$ . Limit is infinity
- vi)  $g \in \Theta(f)$  Not true. The limit is 0 which isn't  $0 < \text{limit} < \text{infinity}$
- vii)  $g \in O(f)$  True for  $n > 0.29$ ,  $\lim f(n) / g(n) < \text{infinity}$
- viii)  $g \in o(f)$  True for  $n > 0.29$ ,  $\lim f(n) / g(n) = 0$
- ix)  $g \in \Omega(f)$  Not true. Limit isn't  $> 0$ .
- x)  $g \in \omega(f)$  Not true. Limit isn't infinity

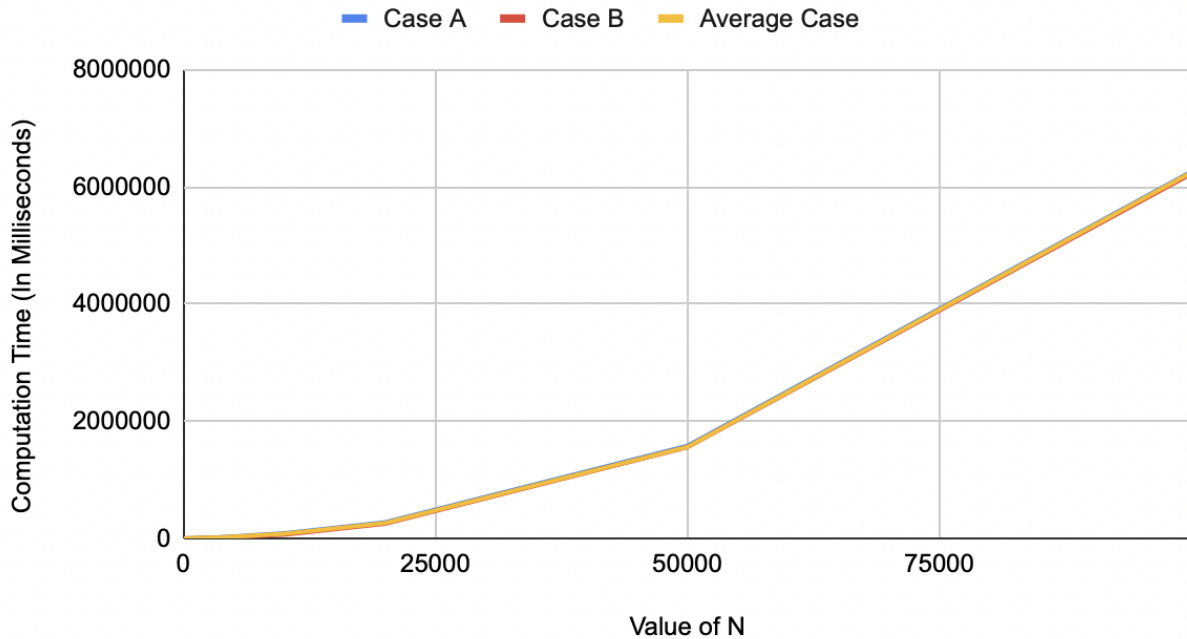
d) B

- i)  $f \in \Theta(g)$  Not true. Limit isn't less than infinity and greater than 0.
- ii)  $f \in O(g)$  Not true. Limit is less than infinity
- iii)  $f \in o(g)$  Not true. Limit isn't 0.
- iv)  $f \in \Omega(g)$  True for  $n > 1.031$ . Limit  $> 0$
- v)  $f \in \omega(g)$  True for  $n > 1.031$ . Limit is infinity
- vi)  $g \in \Theta(f)$
- vii)  $g \in O(f)$
- viii)  $g \in o(f)$
- ix)  $g \in \Omega(f)$

x)  $g \in \omega(f)$

Problem 3.2 d)

### Case A, Case B and Average Case



Problem 3.2 e)

As can be seen in the graph, computation times are similar for increasing values of N, but the higher the N value the bigger the difference between Case A (worst), Case B (best), and the Average Case. For much higher values of N (which are impractical to compute) the difference could be seen in the graph.