

1) Give 5 asymptotic bounds for the function below, one for each of O , Ω , Θ , o , and ω .

$$f(n) = n^2 \log^2(n) + 5n^3 + 7$$

$f(n)$ is $O(n^3)$, $\Omega(n^3)$, $\Theta(n^3)$, $o(n^3 \log(n))$, and $\omega(n^2)$.

(There are other possible answers too)

2) Show that $f(n) = n^3 + 3n$ is $O(n^3)$.

For $n \geq 3$ we see that $f(n) \leq 2n^3$ because:

$$n^3 + 3n \leq n^3 + n^2 \leq n^3 + n^3 = 2n^3$$

Hence $n^3 + 3n$ is $O(n^3)$.

(There are other possible answers too. Most people showed that $n^3 + 3n \leq 4n^3$ for $n \geq 1$ which is fine)

3) You and three friends are at a restaurant. You're going to order a total of 4 beverages and 4 meals. You each will order beverages separately from a list of 12 choices. Together you will order 4 different meals and share them all with each other, from a list of 21 choices. How many different dining options do you have?

$$12^n \cdot \binom{21}{4}$$