Object ....

1- Yes

2- No

3- No

1- $g(n) = n^3$

$f(n) = 3n^3 + n^2 + n$

. دول دالة مشتقة ، $t(n) \leq c_1 \cdot g(n)$

$\therefore 3n^3 + n^2 + n \leq n^3 \cdot c_1$

. هذه الدالة كشَر الجبية $c_1 = 5$

$t(n) \geq c_2 \cdot g(n)$

$\therefore 3n^3 + n^2 + n \geq c_2 \cdot 2n^3$

$3n^3 + n^2 + n \geq 2n^3 \cdot c_2$

$c_2 = 2$

$5n^3 \geq 3n^3 + n^2 + n \geq 2n^3$ $\quad$ $\Omega \geq \Theta \geq O$

$\Theta(n^3) = f(n)$

$\therefore \Theta(g(n)) = f(n)$

2- $g(n) = 2^n$, $f(n) = 2^{n+1}$

$f(n) \leq c_1 \cdot g(n)$

$2^{n+1} = 2^n \times 2^1 \leq 2^n \cdot c_1$

$\therefore c_1 = 2$

$f(n) \geq c_2 \cdot g(n)$

$2^n \times 2 \geq 2^n \cdot c_2$

$c_2 = 2$

$\Omega \geq \Theta \geq O$

$2 \cdot 2^n \geq 2^{n+1} \geq 2 \cdot 2^n$

$\therefore \Theta(2^n) = f(n)$

Object .....

Q_3

1- $f(n) = n^3$, $g(n) = n^2$

$\Omega \rightarrow f(n) \geq c_1 \cdot g(n)$

$n^3 \geq c_1 \cdot n^2$

$c_1 \leq n$

. n^3 grows faster than n^3

$f(n) = \Omega(n^2)$

$n^3 \in \Omega(n^2)$

$O \rightarrow f(n) \leq c_2 \cdot g(n)$

$n^3 \leq c_2 \cdot g(n)$

$n^3 \leq c_2 \cdot n^2$ ✗✗

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2 - $f(n) = \log(n)$, $g(n) = \log^2(n)$

$\Omega \rightarrow f(n) \geq c_1 \cdot g(n)$

$\log(n) \geq c_1 \cdot \log^2(n)$

$\log(n) \geq c_1 \frac{\log(n)}{\log(2)}$

$c_1 \leq \log(2)$

$\therefore \Omega(g(n)) = f(n)$

$\therefore \log(n) = \Omega(\log^2(n))$

$O \rightarrow f(n) \leq c_2 \cdot g(n)$

$\log(n) \leq c_2 \frac{\log(n)}{\log(2)}$

$\log(2) \leq c_2$

$\therefore O(g(n)) = f(n)$

$\log(n) = O(\log^2(n))$ ✗✗

Object ....

Q4.

best case □n < f(n) ≤ worst case □n

$\Omega(n)$ $O(n)$

$c_1 =$ $c_2 =$

$n_{01} =$ $n_{02} =$

حيث حيث

best case worst case

$f(n) \geq c_1 \cdot g(n)$ $f(n) \leq c_2 \cdot g(n)$

$n \geq n_0$ $n \geq n_0$

Q5.

$o(g(n))$ $f(n) < c_1 g(n)$, $n \geq n_0$

$w(g(n))$ $f(n) > c_2 g(n)$, $n \geq n_0$

$\therefore c_1 \cdot g(n) \geq f(n) \geq c_2 \cdot g(n)$

لا يوجد هنا الدوال التي تنمو بسرعة.

يوجد هنا الدوال التي تنمو ما ببطئ.

$\therefore o(g(n)) \cap w(g(n)) = 0$
