CPE 360 Midterm

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① Datastructures in the heap take up less memory and leave space in application space for other processes. These datastructures can get bigger or smaller while running. For example, amazon will use a datastructure in the heap for a customers shopping cart, otherwise they would need terrabytes of storage in their servers. With a data structure in the heap they can have a cart as big as they want.

② a] $3n^2 + 4n^3 + 5 = O(n^2)$ $n^2 \leq n^3$

False; $3n^2 + 4n^3 + 5 \geq C \cdot n^2$, should be $C \cdot n^3 \rightarrow O(n^3)$

No C that makes $0 \leq 3n^2 + 4n^3 + 5 \leq Cn^2$ true

b] $8 \log n + 4n = O(n)$

$8 \log n + 4n \leq c \cdot n$ if $C \geq 12$ therefor **true**

c] $2^n + 4n^3 = O(n^3)$

$2^n \geq n^3$ @ $n \geq 10$

there is no C @ $n \geq 10$ that makes $2^n + 4n^3 \leq Cn^3$ therefor **False**

should be $O(2^n)$

d] $2n^2 + 3n = O(n^2)$ **True**

$2n^2 + 3n \leq C \cdot n^2$ if $C = 5$ @ $n = 1$

e] $2^n + n^2 + O(n) = O(n^2)$

$2^n \geq n^2 \geq n$ @ $n \geq 5$

there is no C @ $n \geq 5$ that makes $2^n + n^2 + C \cdot n \leq C \cdot n^2$ therefor **False**