Name: (Print) PHONG VO

1. **Relative Asymptotic Growths.** Indicate, for each pair of expressions (A, B) in the table below, whether A is O, Ω, Θ of B, i.e., A = O(B), A = Ω(B), A = Θ(B). Assume that k ≥ 1 and c > 1 are constant. Your answer should be in the form of the table with "yes" or "no" written in each box. (15 points, 1 point for each box)

| | A | B | O | Ω | Θ |
|---|---|---|---|---|---|
| a. | $200n^2+20n$ | $n^2$ | X | X | Y |
| b. | $c^n$ | $n^k$ | | Y | |
| c. | $5^n$ | $5^{10n}$ | Y | | |
| d. | $n^{\lg c}$ | $c^{\lg n}$ | X | X | Y |
| e. | $n\lg n$ | $\lg^2 n$ | | Y | |

2

−4

2. **Asymptotic Growth of Functions and Notations** (no partial credit) (15 points)

Clues:

(1) $f_1(n) = \Omega(3^{-n})$ (2) $f_2(n) = \Omega(n\lg^2 n)$ (3) $f_3(n) = O(3n+3)$

(4) $f_4(n) = O(\lg\lg(8^n))$ (5) $f_5(n) = \Theta((2^{\lg n})^3)$

$= \lg 3n$ $= n^3$

Circle TRUE (the statement must be always TRUE based on the clues above) or circle FALSE otherwise.

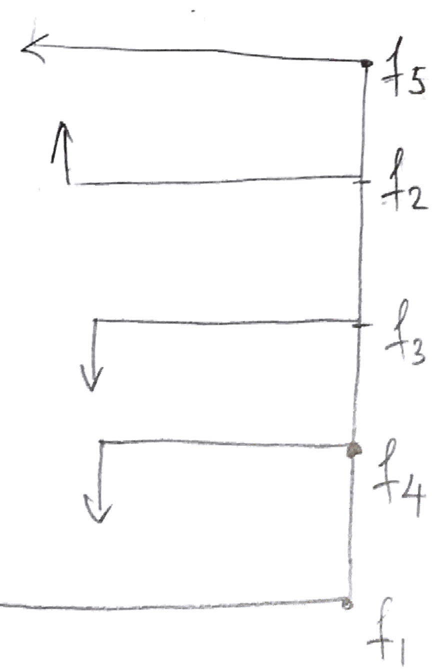
(a) $f_2(n) = \Theta(f_5(n))$ TRUE X FALSE

(b) $f_2(n) = \Omega(f_1(n))$ TRUE FALSE

(c) $f_1(n) = O(\lg\lg(8^n))$ $f_4$ TRUE FALSE

(d) $f_3(n) = O(f_2(n))$ TRUE FALSE

(e) $f_4(n) = O(f_3(n))$ TRUE FALSE




$\lg\lg 8^n = \lg(n\lg 8)$

$= \lg(3n) =$

−3