CPSC 331
Tutorial5

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Order of Growth

- In previous tutorial we see an example of worst case , avg case and best case.
- They were as follows:

Worst case / avg case :

$$an^2 + bn + c$$

(quadratic function of n)

Best case:

$$an + b$$

(Linear function of n)

- In order to ease our analysis of the procedure:
  - Ignore the actual cost of each statement, c_i

  These constants give us more detail than we really need

  - We need one more simplification

  the order of growth of the running time really interests us . So consider only the leading term of a formula

  Since the lower-order terms are relatively insignificant for large values of n.

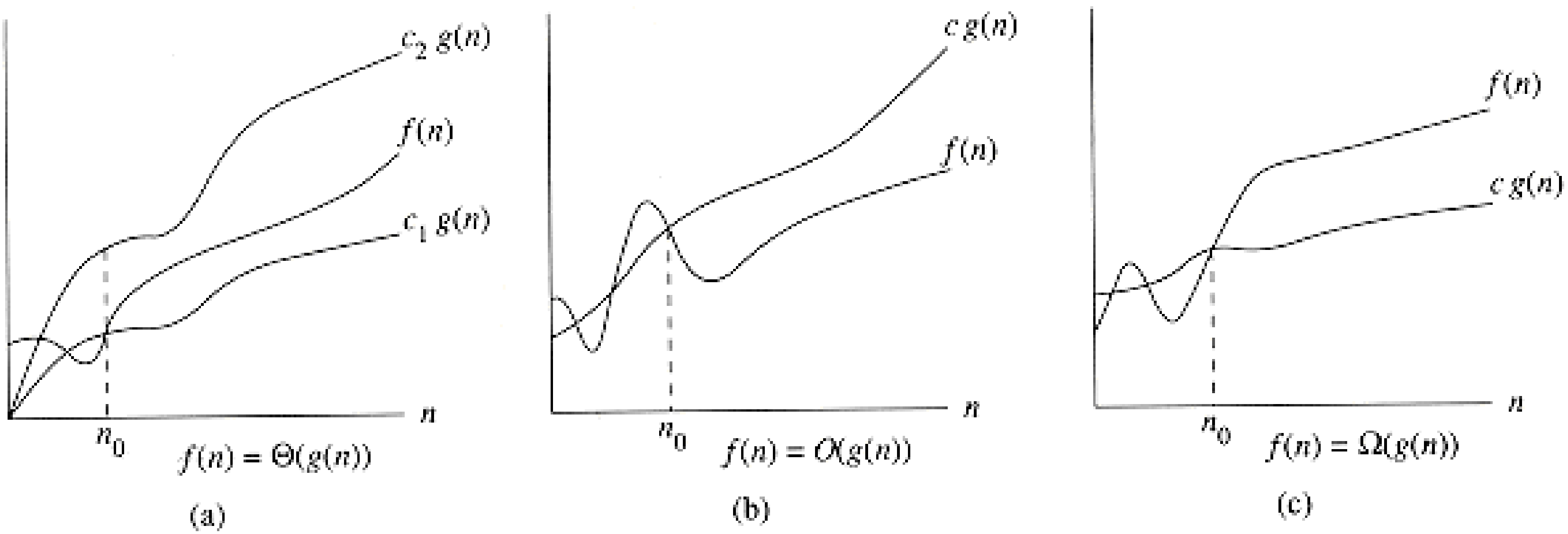
  - Ignore the leading term's constant coefficient

Growth of Functions

- For a given function g(n) we have :
  - Θ(g(n)) = {f(n) : there exist positive constants c_1, c_2 and n_0 such that $0 \le c_1 g(n) \le f(n) \le c_2 g(n)\ for\ all\ n \ge n_0$}
  - Function f(n) belongs to the set Θ(g(n))

  - O(g(n)) = {f(n) : there exist positive constants c and n_0 such that $0 \le f(n) \le c\ \ g(n)\ for\ all\ n \ge n_0$}
  - To give an upper bound of a function

  - Ω(g(n)) = {f(n) : there exist positive constants c and n_0 such that $0 \le c\ \ g(n) \le f(n)\ \ for\ all\ n \ge n_0$}


$c_2\, g(n)$
$f(n)$
$c_1\, g(n)$
n
n_0
$f(n) = \Theta(g(n))$
(a)
$c\, g(n)$
$f(n)$
n
n_0
$f(n) = O(g(n))$
(b)
$f(n)$
$c\, g(n)$
n
n_0
$f(n) = \Omega(g(n))$
(c)

Questions

Write proofs of each of the following claims about functions of a positive integer n.

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

Questions

- b) $n^3 \in o(n^4)$