Assignment # 01

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Q1) $7n - 2 = O(n)$

f(n) = 7n-2

g(n) = n

f(n) /g(n) ≤ C g(n) /g(n) = C

choose k = 1

f(n)/g(n) = (7n-2)/n < (7n-2n)/n = 5n/n = 5

now choose c = 5

- ⇨ 2<2n

Thus 7n-2 is O(n) because 7n-2 <= 5n whenever n>1

Q2) $7n - 2 = \Theta(n)$

f(n) = 7n-2

g(n) = n

c1g(n) <=f(n)<=c2g(n)

Taking LHS

$c_1 n <= 7n-2$

Dividing by "n" on both side

$c_1 <= 7 - 2/n$

put $n = 1$

$c_1 <= 5$

Now it satisfy the condition at $n = 1$

Taking RHS

$7n-2 <= c_2 n$

Dividing by "n" on both side

$7 - 2/n <= c_2$

put $n = 1$

$5 = c_2$

Put $n = 2$

$6 = c_2$

Put $n = 3$

$6.3333333 = c_2$

Put $n = 4$

$6.5 = c_2$

No condition can satisfy c_2

Thus it disproves that it cant be a Theta Notation

Q3) $7n - 2 = \Theta(n^2)$

f(n) = 7n-2

g(n) = n^2

c1g(n) <=f(n)<=c2g(n)

Taking LHS

c1n^2 <=7n-2

Dividing by "n^2" on both side

c1 <= 7/n – 2/n^2

put n = 1

c1 <= 5

Now it satisfy the condition at n = 1

Taking RHS

7n-2<= c2n^2

Dividing by "n^2" on both side

7/n – 2/n^2<= c2

put n = 1

5= c2

Put n = 2

$3 = c2$

Put $n = 3$

$2.111=c2$

Put $n = 4$

$1.625=c2$

Now it satisfy the condition at $n = 4$

Thus it proves $7n - 2 = \Theta(n^2)$ can be a theta notation

Q4) $3n^3 + 20n^2 + 5 = O(n^6)$

$f(n) = 3n^3 + 20n^2 + 5$

$g(n) = n^6$

$f(n) /g(n) \le C\, g(n) /g(n) = C$

choose $k = 1$

$f(n)/g(n) = (3n^3 + 20n^2 + 5)/n^6 < (3n^6 + 20n^6 + 5n^6)/n^6 = 28n^6/n^6 = 28$

now choose $c = 28$

- ⇨ $6<6n^6$

Thus $3n^3 + 20n^2 + 5$is $O(n^6)$ because $3n^6 + 20n^6 + 5n^6 <= 28n^6$ whenever $n>1$