

## 2CS503 Design and Analysis of Algorithms

### Tutorial 2: Asymptotic Notations

Q-1. Find the  $\theta$ -notation for the functions.

$$1. f(n) = \frac{1}{3} n^3 + \frac{1}{2} n^2 + \frac{1}{6} n$$

$$2. f(n) = 27n^2 + 16n$$

$$3. f(n) = 3 * 2^n + 4n^2 + 5n + 3$$

Q-2. Find the O-notation for the functions.

$$1. f(n) = 5 n^3 + n^2 + 3n + 2$$

$$2. f(n) = 3 n^3 + 4n$$

Q-3. Show that for any real constants a and b, where  $b > 0$

$$(n + a)^b = \theta(n^b)$$

Q-4. Is  $2^{n+1} = O(2^n)$ ? Is  $2^{2n} = O(2^n)$ ?

Q-5. Prove that:  $(n \log n - 2n + 13) = \Omega(n \log n)$

Q-6. Prove that  $\sum_{i=1}^n \log(i)$  is  $\theta(n \log n)$