

# Home Work 2: Question 1 answers

1.  $\Theta(n^3)$
2.  $\Theta(n)$
3.  $\Theta(n^2 \lg n)$
4.  $\Theta(n^2)$
5.  $\Theta(n^{2.8})$
6.  $\Theta(n^2)$
7.  $\Theta(\sqrt{n} \lg n)$
8.  $\Theta(\lg \lg n)$
9.  $\Theta(n^{1.58})$
10.  $\Theta(n \lg \lg n)$
11.  $\Theta(n \lg n)$
12.  $\Theta(n \lg \lg n)$
13.  $\Theta(n)$
14.  $\Theta(\lg n)$
15.  $\Theta(n \lg n)$
16.  $\Theta(n \lg n)$
17.  $\Theta(n^2 \sqrt{n})$
18.  $\Theta(n \lg \lg n)$

**Question 9 series solution:**

$$\sum_{i=0}^{\lg n} \left(\frac{3}{2}\right)^i (\lg n - i)$$

assuming  $j = i - \lg n$ , the above summation becomes:

$$\sum_{j=-\lg n}^0 \left(\frac{3}{2}\right)^{j+\lg n} (-j)$$

$$\implies \left(\frac{3}{2}\right)^{\lg n} \sum_{j=-\lg n}^0 \left(\frac{3}{2}\right)^j (-j)$$

assuming  $k = -j$ , the above summation becomes:

$$\left(\frac{3}{2}\right)^{\lg n} \sum_{k=0}^{\lg n} \left(\frac{3}{2}\right)^{-k} (k)$$

$$\implies \left(\frac{3}{2}\right)^{\lg n} \sum_{k=0}^{\lg n} \left(\frac{2}{3}\right)^k (k)$$

$$\implies \left(\frac{3}{2}\right)^{\lg n} O(1) : \text{derivative of decreasing geometric series}$$

$$\implies \Theta(n^{0.58})$$