

# Tutorial 5

## COMP 3601

### Design and Analysis of Algorithms

#### Question 1

The best-case number of key comparisons by the quicksort algorithm is

$$C_b(n) = 2C_b(n/2) + n \quad \text{for } n > 1, \text{ where } C_b(1) = 0.$$

Solve the above recurrence by the backward substitution method for  $n = 2^k$ .

#### Question 2

Show how to multiply two complex numbers  $x = a + bi$  and  $y = c + di$ , using only three multiplications, where  $i^2 = -1$ .

#### Question 3

Prove the equality  $a^{\log_b c} = c^{\log_b a}$ .

#### Question 4

Solve the recurrence  $T(n) = T(\sqrt{n}) + 1$ , where  $T(n)$  is constant for  $n \leq 2$ .

#### Question 5

Solve the recurrence  $T(n) = T(\sqrt{n}) + 2$ , where  $T(n)$  is constant for  $n \leq 2$ .