CSE 3101: Design and Analysis of Algorithms
Assignment 2 Do not submit - solutions will be posted soon

Notes:

- Feel free to refer to, and use any facts from the textbook.
- Please try to solve the problems before looking at the solutions.

Problems:

1. If you want practice doing inductive proofs, try the following problem. Use mathematical induction to show that $(25)^{n+1} - 24n + 5735$ is divisible by $(24)^2$ for all $n = 1, 2, \ldots$.
2. Problems 3-2, 3-3, 3-4 (page 61 in Edition 3, page 58 in Edition 2)
3. Do problem 269 on page 52 of "Problems on Algorithms".
4. Solve the following recurrence to get a big-O bound, where $T(1) = 1$ and for $n > 1$,

   $$T(n) = 2\sqrt{n}T(\sqrt{n}) + 4n$$

   You may ignore floors and ceilings.
5. Solve the following recurrences to get tight bounds, where $T(1) = 1$ and for $n > 1$,

   (a) $T(n) = 9T(n/9) + \log^3 n$.
   (b) $T(n) = 4T(\sqrt[3]{n}) + n$.
   (c) $T(n) = 3T(n/2) + n \log n$.

   You may ignore floors and ceilings.
6. Evaluate the output of the following function Foo as a function of n. What is the running time of Foo?

```
Foo(n)
1  r ← 0;
2  for i ← 1 to n
3  do for j ← 1 to i
4      do for k ← j to i + j
5          do r ← r + 1
6  return r
```

7. For the following segment of code, find the exact value of $T(n)$.

```
T(n)
1  if n = 1
2    then return 1
3    else  sum = 0;
4          for i = 1 to n − 1
5          do sum = sum + T(i)
6              return(sum + n)
```