# CS131 Homework #7 (20 pts)

1) (6 pts) Find solution of the recurrence relations together with the initial conditions. Show your work, circle or put in bold each intermediate and final answer.

    a. $a_n = 2a_{n-1} + 2n^2$ for $n \geq 2$, $a_1 = 4$

    b. $a_n = -5a_{n-1} - 6a_{n-2} + 42 \cdot 4^n$ for $n \geq 3$, $a_1 = 56$, $a_2 = 278$.

    c. $f(n)=2f(n/3)+4$ for any $n=3^k$ (k-integer, $k \geq 1$); $f(1)=1$.

    d. Derive $O()$ estimate of $f(n)$, true for any $n>1$, where $f(1)=1$ and $f(n)$ is increasing function of $n$, satisfying recurrence relation *1c* for any $n=3^k$ (k-integer, $k \geq 1$).

2) (9 pts) Give big-O estimate for f(n) satisfying the following recursive relation:

    a. *f(n)=f(n/b)+C, b is an integer >1*

    b. *f(n)=f(n/b)+Cn, b is an integer >1*

    c. *f(n)=2f(n/2)+C*

    d. *f(n)=3f(n/3)+C*

    e. *f(n)=4f(n/2)+C*

    f. *f(n)=2f(n/2)+Cn*

    g. *f(n)=2f(n/2)+Cn²*

    h. *f(n)=7f(n/2)+Cn²*

    i. *f(n)=2f(n/2)+C√n*

3) (5 pts) Which of the recurrence relations in 2) describe the number of operations performed by

    a. binary search

    b. merge sort

    c. recursive min-max algorithm

    d. fast matrix multiplication

    e. the closest pair problem