

King Fahd University of Petroleum and Minerals
 College of Computer Science and Engineering
 Information and Computer Science Department

ICS 253-01: Discrete Structures I
 Summer 2012-2013
 Quiz#2, Saturday June 29, 2013.

Name:

Sample Solution

ID#:

1. (4 points) Find $\bigcup_{i=1}^{\infty} A_i$ and $\bigcap_{i=1}^{\infty} A_i$ if for every positive integer i , $A_i = (0, i)$, that is, the set of real numbers x with $0 < x < i$.

$$\bigcup_{i=1}^{\infty} A_i = \mathbb{R}^+$$

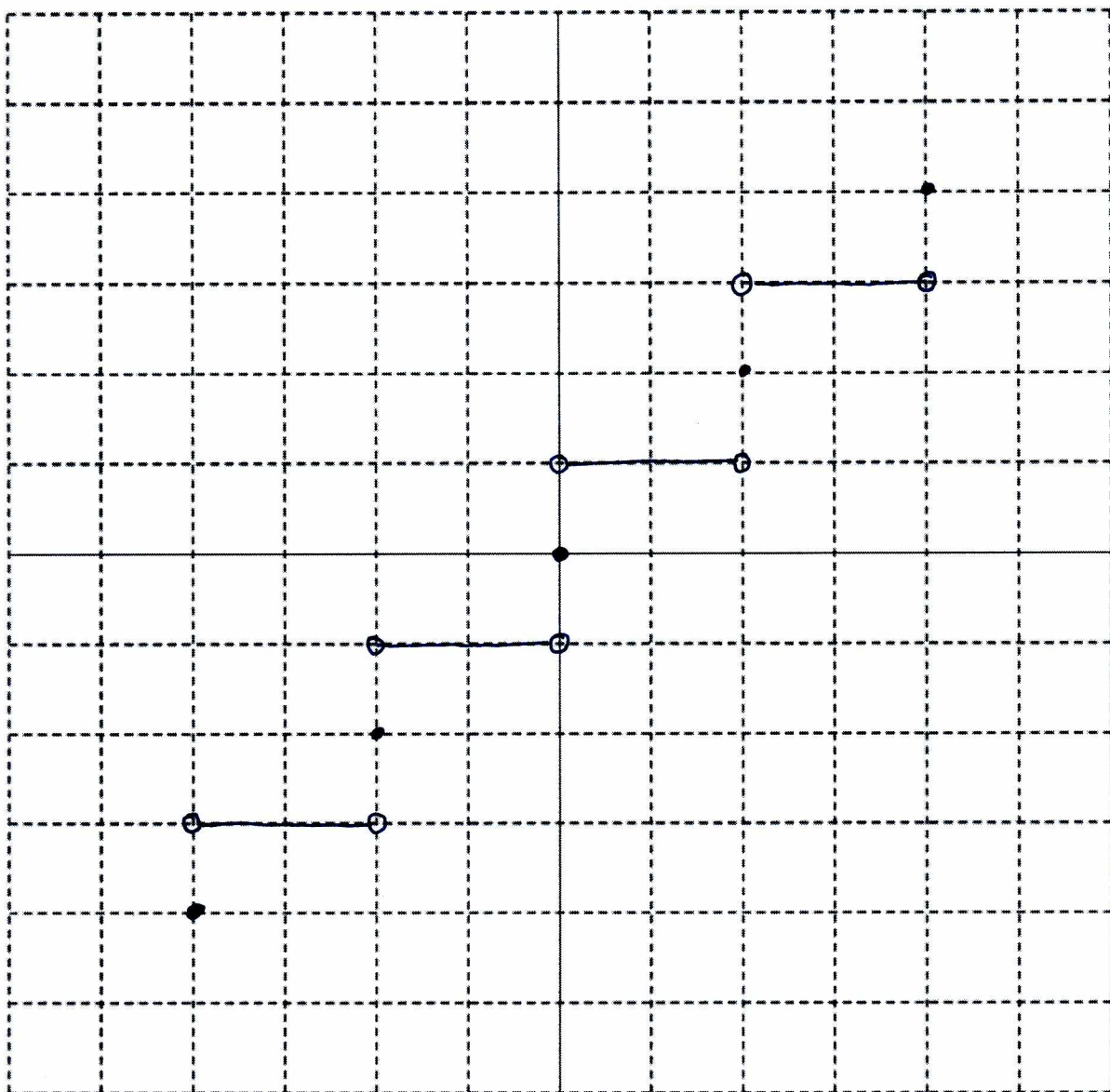
$$\bigcap_{i=1}^{\infty} A_i = A_1 = (0, 1)$$

2. Show that the sequence $\{a_n\}$ where $a_n = -n + 2$ is a solution of the recurrence relation
 $a_n = a_{n-1} + 2a_{n-2} + 2n - 9 \dots \textcircled{1}$

Substituting a_{n-1} & a_{n-2} in $\textcircled{1}$, we get

$$\begin{aligned} & -(n-1) + 2 + 2(-n+2) + 2n - 9 \\ = & -n + 1 + 2 + 2(-n+4) + 2n - 9 \\ = & -n + 3 - 2n + 8 + 2n - 9 \\ = & -n + 2 = a_n \end{aligned}$$

3. (10 points) Draw the graph of $f(x) = \left\lceil \frac{x}{2} \right\rceil + \left\lfloor \frac{x}{2} \right\rfloor$ where f is from $[-4,4]$ to \mathbf{R} .



$$\left\lceil \frac{x}{2} \right\rceil = 1 \Leftrightarrow 0 < \frac{x}{2} \leq 1 \Leftrightarrow 0 < x \leq 2$$

$$\left\lfloor \frac{x}{2} \right\rfloor = 0 \Leftrightarrow 0 \leq \frac{x}{2} < 1 \Leftrightarrow 0 \leq x < 2$$

$$\left\lceil \frac{x}{2} \right\rceil = 2 \Leftrightarrow 1 < \frac{x}{2} \leq 2 \Leftrightarrow 2 < x \leq 4$$

$$\left\lfloor \frac{x}{2} \right\rfloor = 1 \Leftrightarrow 1 \leq \frac{x}{2} < 2 \Leftrightarrow 2 \leq x < 4$$

⋮