King Saud University
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Department of Mathematics

Homework assignment I in M151
Semester 2, 1441 H.

Q1. (a) Construct the truth table of the proposition $(\neg p \vee q) \wedge (q \leftrightarrow \neg r)$.
(b) Without using truth tables, show that $(y \rightarrow x) \rightarrow x \equiv x \vee y$.
Q2. (a) Let a, b and c be integers. Prove by contraposition that if $a+b = c+1$,
then one of a or b or c is odd.

(b) Let m be an integer. Show that $3 \mid m$ if and only if $6 \mid (2m + 24)$.

Q3. (a) Prove that

$$1 + 4 + 7 + \cdots + (3n - 2) = \frac{n(3n - 1)}{2},$$

for all integers $n \geq 1$.
(b) Let $\{u_n\}$ be a sequence defined by the equations:

$$u_1 = 4, \ u_2 = 7 \text{ and } u_{n+1} = \frac{(u_n)^2 - (u_{n-1})^2}{6} + \frac{9}{2} \text{ for } n = 2, 3, 4, \ldots.$$

Show that $u_n = 3n + 1$ for all $n \geq 1$.

Q4. Let R be the relation on $A = \{1, 2, 3, 4\}$ defined as follows:

$$xRy \iff xy > 3.$$

(i) List all ordered pairs of R.

(i) Represent the relation R by a matrix.
(ii) Find $R \cup R^{-1}$ and $R \circ \overline{R}$.

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