

1. Prove or disprove the followings:

20% (a) $[(p \rightarrow q) \rightarrow r] \Leftrightarrow [p \rightarrow (q \rightarrow r)]$

(b) $(p \leftrightarrow q) \leftrightarrow r \Leftrightarrow [p \leftrightarrow (q \leftrightarrow r)]$

2. $n! = n * (n-1) * (n-2) * \dots * 3 * 2 * 1$

20% Prove that $n! > n^2$ for $n \geq 4$

3. Solve the following recurrence relation

20% $a_1 = 5$

$a_2 = -5$

$a_n - a_{n-1} - 6a_{n-2} = 0 \quad (n \geq 3)$

4. Using generating functions to find the number of solutions to the following integer equation:

20% $x_1 + x_2 + x_3 + x_4 = 10$ with $1 \leq x_i \leq 6$

5. Find the generating function for the number of ways an advertising agent can purchase 20 minutes of air time if time slots for commercials come in blocks of 30, 60, or 120 seconds.

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