Introduction to Computer Science I.
Second Repeat of the First Midterm Test

2016. December 16.

1. The system of equations of the line e is $x = t+1,\ y = 2t+1,\ z = 2t+1$, and the equation of the plane S is $4x - 3y + pz = q$. Determine all the values p and q for which the line e is in the plane S.

2. Do the vectors $(x, y, z)^T$ for which $xy = yz$ holds form a subspace of $\mathbf{R}^3$?

3. Determine those values of the parameter p for which the vectors $(1, 1, 2, 2)^T$, $(2, 3, 4, 5)^T$, $(2, 3, 2, 3)^T$ and $(4, 1, 6, p)^T$ are linearly independent.

4. A system of linear equations containing 5 unknowns has infinitely many solutions, but it has no such solutions for which the value of two of the variables are equal. Is it true that after the Gaussian elimination we always get a matrix with 4 nonzero rows?

5. We know that of the entries of the 5×5 matrix A 19 are 0's, and 6 are 1's. How many values can the determinant of A take depending on how we place the different entries?

6. Let $A = \begin{pmatrix} 2 & 4 \\ 3 & 6 \end{pmatrix}$. Show that there are infinitely many such matrices B for which $AB = A$ holds.

The full solution of each problem is worth 10 points. Show all your work! Results without proper justification or work shown deserve no credit.
Notes and calculators (and similar devices) cannot be used.
Grading: 0-23 points: 1, 24-32 points: 2, 33-41 points: 3, 42-50 points: 4, 51-60 points: 5.