Practice test 1 – Math 363, instructor: Pawel Gladki

Time: 60 minutes

1. Prove the following theorem:

$$\sum_{k=1}^{2n}(-1)^{k+1}k^4 = -n(2n+1)(4n^2+2n-1).$$

2. Write in the form $x+iy$ (where x and y are real numbers) the four roots of degree 4 of

$$2-i\sqrt{12}.$$

3. Solve the following system of matrix equations:

$$\begin{cases} \begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix} X + \begin{bmatrix} 3 & 1 \\ 2 & 1 \end{bmatrix} Y = \begin{bmatrix} 2 & 8 \\ 0 & 5 \end{bmatrix} \\ \begin{bmatrix} 3 & -1 \\ -1 & 1 \end{bmatrix} X + \begin{bmatrix} 2 & 1 \\ -1 & -1 \end{bmatrix} Y = \begin{bmatrix} 4 & 9 \\ -1 & -4 \end{bmatrix} \end{cases}$$

4. Let R and S be two equivalence relations on a set A. Is $R \cap S$ an equivalence relation?

5. Let $\mathbb{C}(\infty)$ denote the set of all possible (complex) roots of 1 of all possible degrees. Show that $(\mathbb{C}(\infty), \cdot, 1)$ is an Abelian group.