Univerza na Primorskem
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Koper, 31.08.2018.

NAME: ____________________ STUDENT NUMBER: ____________________

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Algebra III - Abstract algebra

1. Let $\mathrm{GL}_n(\mathbb{R}) \subseteq \mathrm{Mat}_{n\times n}(\mathbb{R})$ denote the set of all $n \times n$ that have an inverse, and in which entries are real numbers. Assume that G is group in $\mathrm{GL}_2(\mathbb{R})$ with respect to multiplication of matrices, and that G have 6 elements. Also assume that $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix} \in G$ in $\begin{pmatrix} -1 & -1 \\ 0 & 1 \end{pmatrix} \in G$.

(a) Find the others element from G? Carefully explain your claim.

(b) Write down Cayley table for G.

(c) Is G abelian? Why?

2. Show that $H = \left\{ \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix} \mid n \in \mathbb{Z} \right\}$ is cyclic subgroup of a group $\mathrm{GL}_2(\mathbb{R})$.

3. By using the first isomorphism theorem, show that $\mathbb{Z} \times \mathbb{Z}/\langle(2,7)\rangle \cong \mathbb{Z}$.

4. Let G denote simple group of order 1188. How many elements of order 11 are in G?

Instructions: Please, write your solutions only with ink or ballpoint pen in blue or black colour. You must return this sheet of paper together with your solutions. You can use calculator. All pages with your solutions must be marked in the following way: "page-number/number-of-pages".