

Math 113 Quiz 1

Don't forget to write down clearly your **Name**:

and **ID number**:

1. True or False (10 points) Check the box in front of a correct answer.

- ☐ The operation $+$ is an associative law of composition on \mathbb{N} .
- ☐ The cancelation law holds on any set with an associative law of composition.
- ☐ The set (\mathbb{Z}, \times) is a group with 1 as unit.
- ☐ Any abelian group is cyclic.
- ☐ $\{\pm 1, 0\}$ is a subgroup of $(\mathbb{Z}, +)$.
- ☐ $GL(2, \mathbb{R})$ is a group with infinitely many elements.
- ☐ $(\mathbb{Z}/(5), +)$ is a group with five elements.
- ☐ The set $\{e^{2k\pi i/5} | 0 \leq k \leq 4\}$, under the usual multiplication of complex numbers, is a cyclic group.
- ☐ The numbers 6 and 13 are coprime.
- ☐ The usual less than " $<$ " on \mathbb{Z} is an equivalence relation.

2. Compute the order of the following elements (6 points).



$$\in S_3$$

$$\bar{2} \in \mathbb{Z}/(6)$$

$$\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix} \in GL(2, \mathbb{R})$$

3. Prove the following statement (4 points). The set G of matrices,

$$G := \left\{ \begin{pmatrix} 1 & a \\ 0 & 1 \end{pmatrix} \middle| a \in \mathbb{Z} \right\}$$

under the usual matrix multiplication, is a subgroup of $GL(2, \mathbb{R})$.