ASSIGNMENT 4. DUE IN CLASS THUS, SEP 20, 2018.

1. (3 pts) Using Euclidean division compute the gcd of 1024 and 560 and express the
gcd as 1024x + 560y where x, y are integers (Bezout identity).

2. (3 pts) Consider the law of composition

\[ x \circ y = (x^3 + y^3)\frac{1}{3} \]

on the set \( \mathbb{R} \) of the real numbers. Prove that this law satisfies the group axioms.

3. (4 pts) Let \( G \) be the set of all \( 2 \times 2 \) real matrices

\[
\begin{bmatrix}
  a & b \\
  0 & d
\end{bmatrix}
\]

with \( ad \neq 0 \). Prove that \( G \) forms a group under matrix multiplication. Is \( G \)
abelian?

4. (5 pts) Two elements \( x, y \) of a group \( G \) are said to be \textit{conjugate} in \( G \) if there exists an element \( s \in G \) such that \( y = sx s^{-1} \). Show that the relation “\( x \) and \( y \)
are conjugate” is an equivalence relation on the set \( G \).

5. (5 pts) Prove that if in a group \( G \), every element is its own inverse, then \( G \) is
abelian.