Homework 2

- Textbook p421: 6, 8, 22, 30, 34
- 1. Let <G, $*$> be a monoid with identity e. Show that if $a * a = e$ for all a in G, then <G, $*$> is Abelian.
- 2. Let <G, $*$> be a group. Prove that if $g \in G$ has the property $g * g = g$, then g is the identity element of G.
- 3. Let <G, $*$> be an Abelian group with identity e, and let $H = \{x \mid x * x = e\}$. Show that <H, $*$> is a subgroup of <G, $*$> .

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- 4. Let G={a, b, c, d}. Prove <G, $*$> is a cyclic group and find out the generator.

$*$	a	b	c	d
a	a	b	c	d
b	b	a	d	c
c	c	d	b	a
d	d	c	a	b

- 5. Let S={a, b, c, d}, P={p_1, p_2, p_3, p_4}. Show that <P, $\circ$> is a permutation group on S.

$$p_1 = \begin{pmatrix} a & b & c & d \\ a & b & c & d \end{pmatrix}$$
$$p_2 = \begin{pmatrix} a & b & c & d \\ b & a & c & d \end{pmatrix}$$
$$p_3 = \begin{pmatrix} a & b & c & d \\ a & b & d & c \end{pmatrix}$$
$$p_4 = \begin{pmatrix} a & b & c & d \\ b & a & d & c \end{pmatrix}$$