MMP II
Exercise Sheet 8

FS 19
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Exercise 1 [Definitions (2 points)]
Define the following terms:

(a) group,

(b) subgroup,

(c) invariant subgroup,

(d) factor group.

Exercise 2 [Special Linear Group (3 points)]
Verify the defining properties of a group for $\mathbf{SL(2,\mathbb{C})}$. (Basic knowledges about matrices may be used.) Determine the number of independent real parameters of $\mathbf{SL(2,\mathbb{C})}$.

Exercise 3 [Special Rotation Group (5 points)]
Show that rotations about the z-axis form a subgroup of $\mathbf{SO(3)}$. Is it Abelian and is it an invariant subgroup?

Exercise 4 [Groups II (5 points)]
Determine the number of independent real parameters in the following groups:

(a) $\mathbf{O(n)}$,

(b) $\mathbf{U(n)}$,

(c) $\mathbf{SU(n)}$.

Give an example for a matrix $A \in \mathbf{O(n)}$ that is *not* an element of $\mathbf{SO(n)}$.