**QUIZ 9** **WED., MAY 30** **NAME:**

**DIRECTIONS:**

- No papers, phones, calculators, or gadgets are permitted to be out during the quiz.
- Show all work, clearly and in order **You will lose points if any of these instructions are not followed.**

| Questions | Points | Score |
|---|---|---|
| 1 | 1 | |
| 2 | 2 | |
| 2 | 2 | |
| Total | 5 | |

**Problem 1:** (1 points) Let $A, B \in M_n(F)$ where $F$ is a field. Let $A = (a_{ij})$ and $B = (B_{ij})$. Define Matrix multiplication.

$$A \cdot B = C = (c_{ij}),$$

where

$$c_{ij} = \sum_{k=1}^{n} a_{ik} b_{kj}.$$

**Problem 2:** (2 points) Define a group.

A group is a nonempty set, $G$, and an operation $\circ$, such that $\forall a, b, c \in G$

1. $a \circ b \in G$
2. $(a \circ b) \circ c = a \circ (b \circ c)$
3. There exists $e \in G$ such that $a \circ e = e \circ a = a$, $\forall a \in G$
4. $\forall a \in G$ there exists $a^{-1} \in G$ such that $a \circ a^{-1} = a^{-1} \circ a = e$

**Problem 3:** (2 points) Label the following true or false

**(a)** (0.5 points) __T__ Let $\sigma \in S_n$, then $\sigma$ is a bijection from $\{1, 2, ..., n\}$ to itself.

**(b)** (0.5 points) __T__ $S_n$ is a group.

**(c)** (0.5 points) __F__ Not all linear transformations can be represented as matrices.

**(d)** (0.5 points) __T__ $M_n(F)$ is commutative if and only if the integer $n$ is $0 < n < 2$.