Part 1. Zeros in Backward Substitution

Suppose you encounter a zero on the diagonal of an upper triangular matrix $U$ on which you are using backward substitution to solve $Ux = b$.

What happens?

(A) The algorithm completes as designed and finds a solution $x$ of $Ux = b$.
(B) The algorithm takes more steps to complete.
(C) For most right-hand side vectors $b$, there is no solution to $Ux = b$.
(D) The algorithm fails to find the correct solution (which exists).

Part 2. Elimination matrices

Consider two $10 \times 10$ elimination matrices $M_4$ and $M_7$.

- $M_4$ only has off-diagonal entries (below the diagonal) in column 4.
- $M_7$ only has off-diagonal entries (below the diagonal) in column 7.

Which of the following is true?

(A) $M_4 = M_7$
(B) $M_4M_7 = M_4 + M_7 - I$ (where $I$ is the identity matrix)
(C) $M_7M_4 = M_4 + M_7 - I$ (where $I$ is the identity matrix)
(D) None of these

Part 3. Forward substitution

You’re given a $2 \times 2$ real-valued, lower triangular matrix $L$ and a right-hand side vector $b$. Use forward substitution to find a vector $x$ so that $L \cdot x$ equals $b$ (at least approximately).

(Since this is a small matrix with a known size, you shouldn’t need for loops or other complicated things.)

```python
import numpy as np
```