1. Prove that if M is an $n \times n$ matrix and can be written in the form

$$M = \begin{pmatrix} A & B \\ 0 & C \end{pmatrix}$$

where A and C are square matrices, then $\det(M) = \det(A) \cdot \det(C)$

You can use the column expansion formula for the determinant, even though I did not prove in the video it is equivalent to the row expansion formula. It follows from problem 3.

2. Prove that if M is an $n \times n$ matrix and can be written in the form

$$M = \begin{pmatrix} A & B \\ C & D \end{pmatrix}$$

where A, B, C, D are square matrices, then it is not necessarily true that $\det(M) = \det(A)\det(D) - \det(B)\det(C)$

3. Prove that for any $n \times n$ matrix M $\det(M) = \det(M^t)$. Do not use column expansion formula for the determinant, since I did not prove it in the videos (Hint: if M is invertible then you can transform I into M by performing a series of elementary operations) You can use

some facts from 308 : M is invertible iff M^t is and $(A \cdot B)^t = B^t \cdot A^t$