Last name: *First name:*

Recommended problems - *Please do NOT turn these in*:

- §2.1: 1, 5, 11, 17, 23, 27, 35
- §2.2: 1, 3, 7, 13, 19
- §2.3: 1a, 3, 5, 11, 21, 23

Submitted problems: *Please turn these problems in*:

(1) Prove that for any $n \times n$ matrix A, $A + A^T$ is symmetric.

(2) Let $A = \begin{bmatrix} 1 & -3 & 0 \\ -2 & 4 & 1 \\ 5 & -2 & 2 \end{bmatrix}$. For this problem, please do not use calculator – make sure that you show your work.
   (a) Evaluate $|A|$ by cofactor expansion.
   (b) Evaluate $|A|$ by by reducing A to an lower triangular matrix.
   (c) Based on determinant of A, state whether A is invertible or not.

(3) Indicate whether the statement is always true or sometimes false. Justify your answer with a logical argument or a counter-example. Assuming that A and B are $n \times n$ matrices.
   (a) $|A + B| = |A| + |B|$
   (b) $|AA^T| = |A|^2$.
   (c) $|AB| = |BA|$
   (d) If A is symmetric, then A is invertible.

(4) Prove the statement: " if $A^2 = A$, then $|A|$ is either 0 or 1".

(5) Let $A,\ B$ be 3×3 matrices and $|A| = -3,\ |B| = 2$. Compute $\left|-2(A^T)^2 B^{-1}\right|$