

**Total time: 10 minutes.**

**Problem 1 (2 points each).** Let

$$A = \begin{pmatrix} 2 & -1 & 1 \\ -1 & 3 & 0 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 \\ 3 & 0 \\ -2 & -1 \end{pmatrix}$$

Determine whether the following are well-defined, and compute them if yes.

$$AB, \quad 2A - B^T, \quad A^T B$$

$$AB = \begin{pmatrix} -3 & 3 \\ 8 & -2 \end{pmatrix}$$

$$2A - B^T = \begin{pmatrix} 4 & -2 & 2 \\ -2 & 6 & 0 \end{pmatrix} - \begin{pmatrix} 1 & 3 & -2 \\ 2 & 0 & -1 \end{pmatrix} = \begin{pmatrix} 3 & -5 & 4 \\ -4 & 6 & 1 \end{pmatrix}$$

$A^T B$  is undefined because  $A^T$  is  $3 \times 2$  and  $B$  is  $3 \times 2$ , inner dimensions do not agree.

**Problem 2 (4 points).** Compute  $A^{-1}$  where

$$A = \begin{pmatrix} 2 & -2 \\ -1 & 3 \end{pmatrix}$$

$$A^{-1} = \frac{1}{2 \times 3 - (-2) \times (-1)} \begin{pmatrix} 3 & 2 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 3/4 & 1/2 \\ 1/4 & 1/2 \end{pmatrix}$$