MATH 1210 A01 Summer 2013 Problem Workshop 6

1. Find the following matrix products, if they exist.

   (a) $\begin{bmatrix} 2 & -3 & 4 \\ 0 & 1 & -2 \\ 3 & -4 & 3 \end{bmatrix} \begin{bmatrix} 3 & 4 & -2 \\ 6 & 2 & 0 \\ 5 & -1 & 3 \end{bmatrix}$

   (b) $\begin{bmatrix} 1 & -2 & 3 \end{bmatrix} \begin{bmatrix} 3 & 4 & 5 \end{bmatrix}$

   (c) $\begin{bmatrix} 1 & -2 & 3 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$

   (d) $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} \begin{bmatrix} 3 & 4 & 5 \end{bmatrix}$

   (e) $\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$

2. If
$$A = \begin{bmatrix} 2 & 1 \\ -2 & 3 \\ 5 & 2 \end{bmatrix}, \quad B = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 2 & 1 \\ 0 & 5 & 2 \end{bmatrix}, \quad C = \begin{bmatrix} 4 & 5 \\ 2 & 6 \\ 0 & 7 \end{bmatrix},$$
   find the matrix X such that
$$3(X + I) - 2AC^T = B^2$$

3. Prove or disprove the following equation for square matrices A and B of the same size.
$$(A - B)(A + B) = A^2 - B^2$$

4. Find the matrix $A = (a_{ij})_{3\times 3}$ if $a_{ij} = i^2 - j$.

Answers

1. (a) $\begin{bmatrix} 8 & -2 & 8 \\ -4 & 4 & -6 \\ 0 & 1 & 3 \end{bmatrix}$

   (b) Not possible

   (c) [10]

   (d) $\begin{bmatrix} 3 & 4 & 5 \\ -6 & -8 & -10 \\ 9 & 12 & 15 \end{bmatrix}$

   (e) Not possible

2. $\begin{bmatrix} 16/3 & 29/3 & 7 \\ 26/3 & 26/3 & 58/3 \\ 80/3 & 64/3 & 34/3 \end{bmatrix}$

3. Not True in general

4. $\begin{bmatrix} 0 & -1 & -2 \\ 3 & 2 & 1 \\ 8 & 7 & 6 \end{bmatrix}$