MEMORIAL UNIVERSITY

DEPARTMENT OF MATHEMATICS & STATISTICS

Assignment 5 **Mathematics 2050** **Fall 2018**

Due: Oct 25,Thursday, 2018 . SHOW ALL WORK

[4] 1. Write down the 3×2 matrix A with $a_{ij} = 3ij - \cos\dfrac{\pi j}{6}$.

[6] 2. Let $\mathbf{v} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $\mathbf{w} = \begin{bmatrix} 0 \\ 4 \\ -5 \end{bmatrix}$. Let $A = (a_{ij}) = \begin{bmatrix} \mathbf{v} & \mathbf{w} \\ \downarrow & \downarrow \end{bmatrix}$ be the 3×2 matrix whose columns are $\mathbf{v}$ and $\mathbf{w}$ and let $B = (b_{ij}) = \begin{bmatrix} \mathbf{v}^T & \rightarrow \\ \mathbf{w}^T & \rightarrow \end{bmatrix}$ be the 2×3 matrix whose rows are $\mathbf{v}^T$ and $\mathbf{w}^T$. Find a_{11}, a_{13}, a_{21}, b_{32}, b_{12}, and b_{22} if possible.

[4] 3. Express $\begin{bmatrix} -1 \\ 14 \\ 2 \end{bmatrix}$ as a linear combination of the columns of $A = \begin{bmatrix} 1 & 2 & 0 \\ 0 & 3 & 1 \\ 0 & 0 & 1 \end{bmatrix}$. Then find a vector x such A$\mathbf{x} = \begin{bmatrix} -1 \\ 14 \\ 2 \end{bmatrix}$

[4] 4. Find the matrix A if : $\left(3A^T + 3\begin{bmatrix} 1 & 0 \\ 0 & 2 \end{bmatrix}\right)^T = \begin{bmatrix} 8 & 0 \\ 3 & 1 \end{bmatrix}$

[6] 5. Compute the following matrix products.

$(a)\begin{bmatrix} 1 & 3 \\ 0 & -2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ 0 & 1 \end{bmatrix}$ $(b)\begin{bmatrix} 5 & 0 & -7 \\ 1 & 5 & 9 \end{bmatrix}\begin{bmatrix} 2 & 3 & 1 \\ 1 & 9 & 7 \\ -1 & 0 & 2 \end{bmatrix}$

[4] 6. Let $A = \begin{bmatrix} 2 & 5 \\ -3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & -5 \\ 3 & k \end{bmatrix}$. What values of k , if any, will make $AB = BA$?

[4] 7. Let A be a 2×2 matrix. If A commutes with $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$, show that $A = \begin{bmatrix} a & 0 \\ c & a \end{bmatrix}$ for some a and c.

[4] 8. A matrix P satisfies $P^2 = P$. Suppose $4Q = I - 2P$, where I denotes the identity matrix with the size of P. What is Q^2 ?

[36]