Assignment No. 6	**MATHEMATICS 2050**	Fall 2004

Due as follows:

Dr. Kondratieva	Tuesday October 26	in class or assignment box #47
Dr. Goodaire	Wednesday October 27	10:00 a.m.
Dr. Yuan	Wednesday October 27	in class

[1] 1. (a) Suppose A and B are matrices such that $AB = 0$. Does this imply $A = 0$ or $B = 0$? If you say "yes", give a proof; if you say "no", give an example of two nonzero matrices A and B for which $AB = 0$.

[2] (b) If A is a 2×2 matrix, $B = \begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$ and $AB = 0$, show that $A = 0$. Does this result contradict your answer to part (a)?

[1] (c) If X and Y are any 2×2 matrices and B is the matrix of part (b), and if $XB = YB$, show that $X = Y$.

[2] 2. It is conjectured that the points $(\frac{\pi}{3}, 2)$ and $(-\frac{\pi}{4}, 1)$ lie on a curve with equation of the form $y = a \sin x + b \cos x$. Assuming this is the case, write down a matrix equation whose solution is $\begin{bmatrix} a \\ b \end{bmatrix}$.

[3] 3. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 5 & -2 \end{bmatrix}$. Compute $(A+B)^2$ and $A^2 + 2AB + B^2$. Are these equal? What is the correct expansion of $(A+B)^2$?

[1] 4. Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 1 \\ 0 & -1 \\ \frac{2}{3} & \frac{1}{3} \end{bmatrix}$. Determine whether or not A and B are inverses.

[2] 5. Given that A is a 2×2 matrix and $\begin{bmatrix} 1 & 2 \\ 3 & 0 \end{bmatrix}^{-1} A \begin{bmatrix} 5 & 1 \\ -1 & 1 \end{bmatrix}^{-1} = \begin{bmatrix} -3 & 4 \\ 0 & 2 \end{bmatrix}$, find A.

[2] 6. If A is any $n \times n$ matrix and x is a vector in R^n, what is the size of $\mathsf{x}^T A \mathsf{x}$ and why?

[2] 7. Find a formula for $((AB)^T)^{-1}$ in terms of $(A^T)^{-1}$ and $(B^T)^{-1}$.

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