# Math 346 Quiz 2A

February 8, 2016

Name: ANSWERS

**Instructions: No calculators! Answer all problems in the space provided! Do your rough work on scrap paper.**

1. For the system:
   $ax_1 + by_1 = c$
   $dx_1 + ey_1 = f$
   Assuming $ae - bd \neq 0$, write down a formula for $x_1 = \dfrac{\begin{vmatrix} c & b \\ f & e \end{vmatrix}}{\begin{vmatrix} a & b \\ d & e \end{vmatrix}} = \dfrac{ce-bf}{ae-bd}$, $y_1 = \dfrac{\begin{vmatrix} a & c \\ d & f \end{vmatrix}}{\begin{vmatrix} a & b \\ d & e \end{vmatrix}} = \dfrac{af-cd}{ae-bd}$

2. For the matrix $A = [a_{ij}] = \begin{pmatrix} 7 & 2 & 3 \\ 5 & 0 & -1 \\ 6 & 7 & \pi \end{pmatrix}$, what is $a_{13} =$ 3 ?

3. Let $A = \begin{pmatrix} 1 & 0 & 3 \\ 2 & -1 & 1 \end{pmatrix}$, $B = \begin{pmatrix} 1 & 0 & 7 \\ 1 & -1 & 5 \\ 3 & 4 & 9 \end{pmatrix}$, $C = \begin{pmatrix} 2 & 0 \\ -1 & 1 \end{pmatrix}$ and $D = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \end{pmatrix}$. Compute the following, or write "DNE", for "does not exist".

   (a) $A + 2D = \begin{pmatrix} 3 & 0 & 3 \\ 2 & 1 & 1 \end{pmatrix}$  (b) $AB = \begin{pmatrix} 10 & 12 & 34 \\ 4 & 5 & 18 \end{pmatrix}$

   (c) $BA =$ DNE  (d) $B - 3A =$ DNE

4. Suppose $C$ and $D$ above were multiplied to find $CD$. Write the size of the result, or "DNE" if they actually cannot be multiplied: $2 \times 3$

5. List the square matrices in problem 3. B, C

6. True or false: Suppose $AB$ is defined. If $A$ has a row of zeros, then $AB$ has a row of zeros. True

7. Justify your answer in problem 6.
   Suppose $A = [A]_{n\times m}$ and $B = [B]_{m\times p}$. Assume $\vec{a}_{(i)} = \vec{0}_m$ is the $i^{th}$ row of $A$. Then the $i^{th}$ row of $AB$ would be $[\vec{a}_{(i)}\cdot\vec{b}_1, \vec{a}_{(i)}\cdot\vec{b}_2 \cdots \vec{a}_{(i)}\cdot\vec{b}_p] = [0 \cdots 0]$. So that $AB$ has a row of zeros; namely, its $i^{th}$ row. ∎

8. Would your answer to problem 6 change if it were $B$ that had the row of zeros? Yes

**Bonus:** (a) What is $tr(B) = 1 + (-1) + 9 = 9$ ?

(b) Write the system in problem 1 as an augmented matrix below:

$$\left(\begin{array}{cc|c} a & b & c \\ d & e & f \end{array}\right)$$

(c) Justify your answer to problem 8.
If $B$ had a row of zeros, the statement would be false.
Counter example: $A = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$, $B = \begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix} \Rightarrow AB = \begin{pmatrix} 2 & 2 \\ 4 & 4 \end{pmatrix}$ (many examples possible).
So $B$ has a row of zeros, but $AB$ does not. □