Math 2568, Quiz #7, Fall 2014 Name KEY

Instructions: Show all work. Answer each question as completely as possible. Use exact values (yes, that means fractions!).

1. If $A = \begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix}, B = \begin{bmatrix} -2 & 2 \\ 0 & -2 \end{bmatrix}$, find the following matrices.

a. $3A - 2B$

$$3\begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix} - 2\begin{bmatrix} -2 & 2 \\ 0 & -2 \end{bmatrix} = \begin{bmatrix} -3 & 0 \\ 9 & -9 \end{bmatrix} + \begin{bmatrix} 4 & -4 \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -4 \\ 9 & -5 \end{bmatrix}$$

b. AB

$$\begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix}\begin{bmatrix} -2 & 2 \\ 0 & -2 \end{bmatrix} = \begin{bmatrix} (-1)(-2)+0 & (-1)(2)+0 \\ 3(-2)+0 & 3(2)+(-3)(-2) \end{bmatrix} =$$

$$\begin{bmatrix} 2 & -2 \\ -6 & 12 \end{bmatrix}$$

c. $A^2 - 4A - 5I_2$

$$\begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix}\begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix} - 4\begin{bmatrix} -1 & 0 \\ 3 & -3 \end{bmatrix} - 5\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} =$$

$$\begin{bmatrix} 1+0 & 0+0 \\ -3-9 & 0+9 \end{bmatrix} + \begin{bmatrix} 4 & 0 \\ -12 & 12 \end{bmatrix} + \begin{bmatrix} -5 & 0 \\ 0 & -5 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ -24 & 16 \end{bmatrix}$$

d. A^{-1}

$$\frac{1}{3-0}\begin{bmatrix} -3 & 0 \\ -3 & -1 \end{bmatrix} = \frac{1}{3}\begin{bmatrix} -3 & 0 \\ -3 & -1 \end{bmatrix} = \begin{bmatrix} -1 & 0 \\ -1 & -1/3 \end{bmatrix}$$

e. $(AB)^{-1}$

$$\frac{1}{2(12)-(-6)(-2)}\begin{bmatrix} 12 & 2 \\ 6 & 2 \end{bmatrix} = \frac{1}{12}\begin{bmatrix} 12 & 2 \\ 6 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 1/6 \\ 1/2 & 1/6 \end{bmatrix}$$

2. List three properties of the Invertible Matrix Theorem.

a matrix is invertible iff: (A is $n \times n$ and...)

the rank of an $n \times n$ matrix is n

The equation $A\vec{x} = \vec{0}$ has only the trivial solution

$\text{Nul } A = \{\vec{0}\}$

etc.

answers will vary.