Your name:

Instructor (please circle): Samantha Allen Angelica Babei

Math 22 Fall 2018 Homework 2, due Fri Oct 12 4:00 pm in homework boxes in front of Kemeny 108 *Please show your work, and check your answers. No credit is given for solutions without work or justification.*

(1) For each of the following matrices, use the Invertible Matrix Theorem to determine whether or not the matrix is invertible. Do not use any part of the theorem more than once (for instance, if you use part (b) to justify one of your answers, you may not use part (b) again). If the matrix is invertible, find its inverse.

(a) $\begin{bmatrix} 4 & 2 & 1 \\ 5 & 6 & 5/4 \\ 8 & 5 & 2 \end{bmatrix}$

(b) $\begin{bmatrix} 2 & 0 & 6 \\ 6 & 1 & 6 \\ -10 & -1 & -27 \end{bmatrix}$

(c) $\begin{bmatrix} -4 & 6 \\ 6 & -9 \end{bmatrix}$

(2) True or false (no working needed, just circle the answer):

(a) T / F: If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $ad = bc$, then A is not invertible.

(b) T / F: If A and B are $n \times n$ invertible matrices, then the matrix equation $(A+B)\mathbf{x} = \mathbf{b}$ has a unique solution for each $\mathbf{b}$ in $\mathbb{R}^n$.

(c) T / F: If the equation $A\mathbf{x} = \mathbf{b}$ has at least one solution for each $\mathbf{b}$ in $\mathbb{R}^n$ and if A is invertible, then the solution is unique for each $\mathbf{b}$.

(d) T / F: For $n \times n$ matrices A and B, $\det(A+B) = \det A + \det B$.

(e) T / F: Each elementary matrix has determinant equal to ± 1.

(3) Let $A = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 2 & 2/3 \\ 0 & 3/2 & -1/2 \end{bmatrix}$ and $B = \begin{bmatrix} 6 & -2 & 4 \\ 0 & -5 & 3 \\ 1 & -1/3 & 2/3 \end{bmatrix}$.

(a) Find $\det A$.

(b) Find $\det B$.

(c) Which of the following are invertible? Justify your answer.

(i) AB^T

(ii) $(AB)^T$

(iii) $(A^T)^3$