King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics
Math 260
Class Test II, Semester II, 2012-2013
Net Time Allowed: 120 minutes

Name:————————————————————————————————————

ID:———————————————Section:—————————————————

1. Without directly solving the following homogeneous system, determine whether it has a nontrivial solution or not: (Show all necessarily work)

$$x - 2y + z = 0$$
$$2x + 3y + z = 0$$
$$3x + y + 2z = 0.$$

2. Find a basis for the solution space of the following homogeneous linear system:

$$x - 3y + 2z - 4w = 0$$
$$2x - 5y + 7z - 3w = 0.$$

3. Use the method of undetermined coefficient to solve the following differential equation:

$$y^{(4)} + y'' = 4\sin x - 2\cos x.$$

4. Let W be the set of all vectors in $\mathbb{R}^4$ such that $x_1 + 2x_2 + 3x_3 + 4x_4 = 0$. Show that W is a subspace of $\mathbb{R}^4$.

5. If A and B are 3×3 matrices with $|A| = 3$ and $|B| = 4$, find $|AB| - |2A^{-1}|$.

6. Show that $\begin{bmatrix} 1 \\ 3 \\ -1 \end{bmatrix}$, $\begin{bmatrix} 0 \\ -1 \\ 2 \end{bmatrix}$, $\begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$ form a basis for $\mathbb{R}^3$.

7. Find the inverse of the matrix A or determine that A^{-1} does not exist:

$$\begin{bmatrix} 0 & -2 & 1 \\ 2 & 4 & -1 \\ 2 & 1 & 2 \end{bmatrix}.$$

8. Using Cramers rule, find the value of x_3 in the following system

$$x_1 + x_2 - x_3 = 6$$
$$x_1 - x_2 + x_3 = 2$$
$$x_1 - 2x_3 = 0$$

9. Find the adjoint matrix for

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 6 \\ 0 & -4 & -12 \end{bmatrix}$$

10. Consider the following matrix $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 0 & 1 \\ 0 & -3 & 0 \end{bmatrix}$

(a) Write the matrix A as a product of elementary matrices.

(b) Using part (a), find the the inverse of A.

11. Find the general solution of $y''' + 6y'' + y' - 34y = 0$ if it is known that $y_1 = e^{-4x}\cos x$ is one solution.