King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Math - 260 Applied Calculus

Test No. 2 *Dr. M. Z. Abu-Sbeih* *August 19, 2009*

Serial No: *Student No.:* *Name:*

1. SHOW ALL WORK. NO CREDITS FOR ANSWERS NOT SUPPORTED BY WORK.
2. All TYPES OF CALCULATORS ARE NOT ALLOWED.

1. **(10 points)** Identify each of the following statement as true or false.
   (a) The dimension of a vector space is equal to the number of elements in any spanning set.
   (b) Any linearly independent set of vectors can be extended to form a basis.
   (c) The dimension of the solution space of a homogeneous system of linear equations is equal to the number of leading variables.
   (d) Any system of linear equations can be solved either by using the inverse matrix or Cramer's Rule.
   (e) If L_1 and L_2 are two differential operators with constant coefficients then $L_1 \bullet L_2 = L_2 \bullet L_1$

2. **(15 points)** Solve the system of equations the system:
$$\begin{aligned} x - y &= -1 \\ y + z &= 5 \\ 2x - 2y + z &= 1 \end{aligned}$$
   by using the inverse matrix of the coefficient matrix.

3. **(15 points)**
   a) Determine whether the vectors are linearly independent or not.
$$\vec{v}_1 = (1,2,3,4), \quad \vec{v}_2 = (0,1,2,0), \quad \vec{v}_3 = (0,0,1,0), \quad \vec{v}_4 = (2,1,0,5)$$
   b) Find all values of *s* and *t* which make the vectors linearly dependent.
$$\vec{u} = (2, t+1, 4), \quad \vec{v} = (6, 12, 3s^2)$$

4. **(15 points)** Find a basis and the dimension of the solution space of the homogeneous system:
$$\begin{aligned} x_1 + x_3 &= 0 \\ x_2 + x_4 &= 0 \\ 2x_1 - x_2 + 2x_3 - x_4 &= 0 \end{aligned}$$

5. **(15 points)** Use the method of undetermined coefficient to find the general solution of the equation: $(D^2+1)y = 12\cos^2 x$.
6. **(15 points)** Find the general solution of : $(D^4 + 2D^3 + 5D^2)y = 0$.

7. **(15 points)** Use the method of variation of parameters to solve the equation: $y'' + y = \csc^3 x \cot x$.