Math2520-01 **Assignment 3**

INSTRUCTION: Show all the necessary work. Write your answer on a separate sheet preferably hand written clear and legible. Post your answer sheet on D2L by Sunday June 20.

1. If $x = (-3, 9, 9)$ and $y = (3, 0, -5)$, find a vector z in R^3 such that $4x - y + 2z = 0$ and its additive inverse.

2. Determine whether the given set S of vectors is closed under addition and is closed under scalar multiplication. The set of scalars is the set of all real numbers. Justify your answer.

   a) The set S = Q , the set of all rational numbers.

   b) The set S of all solutions to the differential equation

   $y' + 3y = 0$ (do not solve the differential equation)

3. Let $S = \{(x, y) \in R^2 : x \geq 0, y \geq 0\}$. Is S a subspace of R^2. Justify your answer.

4. Let $V = C^2(I)$ and S is a subset of V consisting of those functions satisfying the differential equation

$$y'' + 2y' - y = 0,$$

   On *I*. Determine if *S* is a subspace of *V*.

5. a) Determine the null space of the given matrix *A*, nullsapce(*A*) .

$$A = \begin{bmatrix} 2 & 6 & 4 \\ -3 & 2 & 5 \\ -5 & -4 & 1 \end{bmatrix}$$

   b) Determine if $w = \begin{bmatrix} 1 \\ -1 \\ 1 \end{bmatrix}$ is in the nullsapce(A).

6. Let $v_1 = \begin{bmatrix} 2 \\ -1 \end{bmatrix}$, $v_2 = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$ vectors in R^2 . Express the vector $v = \begin{bmatrix} 5 \\ -7 \end{bmatrix}$ as a linear combination of v_1, v_2.

7. Let $v = \begin{bmatrix} 3 \\ 3 \\ 4 \end{bmatrix}$, $v_1 = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$, $v_2 = \begin{bmatrix} 2 \\ 1 \\ 3 \end{bmatrix}$ be in R^3. Let $W = span(v_1, v_2)$. Determine if *v* is in *W*.

8. Determine whether the given set $\{(1,-1,0),(0,1,-1),(1,1,1)\}$ in R^3 is linearly independent or linearly dependent.

9. Use the Wronskian to show that the given functions are linearly independent on the given interval *I*.

$$f_1(x) = 1,\ \ f_2(x) = 3x,\ \ f_3(x) = x^2 - 1,\ \ I = (-\infty, \infty)$$

10. Determine whether the set of vectors,

$$S = \{(1,1,0,2),(2,1,3,-1),(-1,1,1,-2),(2,-1,1,2)\}$$

is a basis for R^4 .

11. Determine whether the set $S = \{1-3x^2, 2x+5x^2, 1-x+3x^2\}$ is basis for $P_2(R)$.

12. Find the dimension of the null space of the given matrix A.

$$A = \begin{bmatrix} 1 & -1 & 4 \\ 2 & 3 & -2 \\ 1 & 2 & -2 \end{bmatrix}$$

13. Determine the component vector of the given vector space V relative to the given ordered basis B .

$$V = R^2;\quad B = \{(2,-2),(1,4)\};\quad v = (5,-10).$$

14. a) find n such that rowspace(A) is a subspace of R^n and determine the basis for rowspace(A).

a) find m such that colspace(A) is a subspace of R^m, and determine a basis for colspace(A).

$$A = \begin{bmatrix} 1 & -1 & 2 & 3 \\ 1 & 1 & -2 & 6 \\ 3 & 1 & 4 & 2 \end{bmatrix}$$

Note: 1. You can use a theorem whenever applicable.

2. Check the video clips posted on D2L related to this chapter.