College of Engineering and Computer Science
Mechanical Engineering Department

California State University Northridge

Mechanical Engineering 501A
Seminar in Engineering Analysis

Fall 2017 Number 15966 Instructor: Larry Caretto

September 6 Homework Problems

1. A vector originating at the point (-3, -8, 1) has components 3, 8, -1. Find the terminating point and the length of the vector.
2. A vector originating at the point (1, ½, -4) has components ¼, ½, -½. Find the terminating point and the length of the vector.
3. Given **a** = [3,-2,1] and **b** = [0, 3, 0], find |**a** + **b**| and |**a**| + |**b**|.
4. Given **a** = [3,-2,1] and **b** = [0, 3, 0], find the following expressions: **a**/|**a**| and **b**/|**b**|.
5. Given **a** = [1, 1, 0], **b** = [3, 2, 1], and **c** = [1, 0, 2], find the angles between **b** – **a** and **c** – **a**.
6. Find the angle between straight lines x – y = 1 and x – 2y = -1
7. Find the component of **a** = [4, 0, -3] in the direction of **b** = [1, 1, 1].
8. Find the matrix sums 5**D** – 3**C** and 5$\mathbf{D}^T$ – 3$\mathbf{C}^T$ for the matrices shown below.

$$\mathbf{D} = \begin{bmatrix} 4 & 0 & -4 \\ -3 & 4 & 9 \end{bmatrix} \qquad \mathbf{C} = \begin{bmatrix} 6 & 0 & 3 \\ 1 & 0 & -5 \end{bmatrix}$$

9. Find the vector sums 3(**c** – 4**d**) and 3**c** – 12**d** for the vectors shown below.

$$\mathbf{c} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix} \qquad \mathbf{d} = \begin{bmatrix} 2 \\ -2 \\ 6 \end{bmatrix}$$

10. Find the matrix products, if they exist, **Ca**, **Cd**, and **dC**, for the matrices shown below.

$$\mathbf{C} = \begin{bmatrix} 4 & 6 & 2 \\ 6 & 0 & 3 \\ 2 & 3 & -1 \end{bmatrix} \qquad \mathbf{a} = \begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix} \qquad \mathbf{d} = \begin{bmatrix} 4 & 3 & 0 \end{bmatrix}$$

11. Evaluate the determinant shown at the right.

$$\begin{vmatrix} 3 & 2 & 0 & 0 \\ 6 & 8 & 0 & 0 \\ 0 & 0 & 4 & 7 \\ 0 & 0 & 2 & 5 \end{vmatrix}$$

12. Show that $(\mathbf{A}^{-1})^T = (\mathbf{A}^T)^{-1}$.