MATH 260
SUMMER 2015 NAME:
EXAM 1

1. [10 pts.] Find the angle between the vectors $\mathbf{p} = [1, -3, 4]$ and $\mathbf{q} = [3, 5, -2]$, to the nearest tenth of a degree.

2. [10 pts.] Find a parametric equation for the line through the points $(4, 5, 1)$ and $(1, 3, -2)$.

3. [10 pts.] Find both a parametric and nonparametric equation for the plane containing the point $(0, 0, 0)$ that is orthogonal to the line having parametric equation

$$\mathbf{p}(t) = [3, -2, 1] + t[2, 1, -3].$$

4. [10 pts.] Find the distance between the point $q = (1, -2, 4)$ and the plane $3x + 2y - 2z = 3$.

5. [10 pts.] Solve the system using Gaussian elimination to obtain a row-echelon form for the augmented matrix. Write the general solution in vector form.

$$\begin{cases} x \quad - z = 1 \\ -2x + 3y - z = 0 \\ -6x + 6y \quad = -2 \end{cases}$$

6. [10 pts.] Solve the system using Gaussian elimination to obtain a row-echelon form for the augmented matrix. Write the general solution in vector form.

$$\begin{cases} 3x - 6y - z + w = 7 \\ -x + 2y + 2z + 3w = 1 \\ 4x - 8y - 3z - 2w = 6 \end{cases}$$

7. [10 pts.] Find conditions on the general vector $\mathbf{b}$ that would make the equation $\mathbf{Ax} = \mathbf{b}$ consistent, where

$$\mathbf{A} = \begin{bmatrix} 1 & 0 & -1 \\ -2 & 3 & -1 \\ 3 & -3 & 0 \\ 2 & 0 & -2 \end{bmatrix}.$$

8. [10 pts.] Given

$$\mathbf{A} = \begin{bmatrix} 1 & -2 & 3 & -4 \end{bmatrix} \quad \text{and} \quad \mathbf{B} = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix},$$

find the products $\mathbf{AB}$ and $\mathbf{BA}$, if defined.

9. [10 pts.] Find a 3×3 matrix $\mathbf{A}$ such that $\mathbf{A}^2 \neq \mathbf{O}$ but $\mathbf{A}^3 = \mathbf{O}$.

10. [10 pts.] Given the 3×2 matrix

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

find all 2×3 matrices $\mathbf{X}$ such that $\mathbf{XA} = \mathbf{I}$ holds. Such a matrix is called a **left inverse of A**.