Assignment No. 4	**MATHEMATICS 2050**	Fall 2004

Due as follows:

Dr. Kondratieva	THURSDAY October 14	in class or assignment box
Dr. Goodaire	Wednesday October 13	10:00 a.m.
Dr. Yuan	Wednesday October 13	in class

[2] 1. (a) Suppose $\mathsf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ is a vector in the plane spanned by nonparallel vectors u and v. Show that any scalar multiple of x lies in the same plane.

[2] (b) Let $\mathsf{x} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ be a vector in the plane π whose equation is $ax + by + cz = 0$. Show that any scalar multiple of x is also in π.

[2] 2. (a) Find the distance from $P(1,1,1)$ to the plane π with equation $x - 3y + 4z = 10$.

[2] (b) Find the point of π which is closest to $(1,1,1)$. (See Exercise 5 in Section 1.4.)

[2] 3. (a) Find two orthogonal vectors in the plane π with equation $2x - y + z = 0$.

[2] (b) Use your answer to part (a) to find the projection of $\mathsf{w} = \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix}$ on π.

4. Let ℓ_1 and ℓ_2 be the lines with equations

$$\ell_1\colon \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix} + t\begin{bmatrix} 2 \\ 1 \\ -3 \end{bmatrix}, \qquad \ell_2\colon \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ -2 \end{bmatrix} + t\begin{bmatrix} 0 \\ 1 \\ -1 \end{bmatrix}.$$

[3] (a) Show that ℓ_1 and ℓ_2 are not parallel and that they do not intersect.

[3] (b) There is a plane containing ℓ_1 and parallel to ℓ_2. Find the equation of this plane.

[1] 5. Determine, with justification, whether or not $\mathsf{v} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{bmatrix}$ is a linear combination of $\mathsf{v}_1 = \begin{bmatrix} 3 \\ 4 \\ 5 \\ 1 \\ 2 \end{bmatrix}$, $\mathsf{v}_2 = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 5 \\ 1 \end{bmatrix}$, $\mathsf{v}_3 = \begin{bmatrix} -1 \\ -2 \\ -3 \\ -4 \\ -5 \end{bmatrix}$, $\mathsf{v}_4 = \begin{bmatrix} 4 \\ 5 \\ 1 \\ 2 \\ 3 \end{bmatrix}$, and $\mathsf{v}_5 = \begin{bmatrix} 5 \\ 1 \\ 2 \\ 3 \\ 4 \end{bmatrix}$.

[19]

