(107)輔仁大學碩士班招生考試試題	考試日期：107 年 3 月 9 日第 2 節
	本試題共 1 頁 (本頁為第 1 頁)

科目： 工程數學（線性代數、微分方程）　　系所組：電機工程學系碩士班

1. For the vectors $\mathbf{a} = 2\mathbf{i} + 3\mathbf{j} + \mathbf{k}$ and $\mathbf{b} = -\mathbf{i} + 5\mathbf{j} + \mathbf{k}$

(1.1) (5%) please find the magnitude of vectors **a** and **b**

(1.2) (5%) find the angle between two vectors

2. (10%) Find the area of the triangle determined by the points $P_1(3, 0, -1)$, $P_2(2, 3, 4)$ and $P_3(1, 1, 1)$

3. (10%) The set A = $\{\mathbf{u}_1, \mathbf{u}_2\}$, where $\mathbf{u}_1 = (3, 1)$, $\mathbf{u}_2 = (1, 1)$, is a basis for R^2. Transform the set A into an "orthonormal" basis B = $\{\mathbf{v}_1, \mathbf{v}_2\}$

4. For the matrix $\mathbf{A} = \begin{bmatrix} 2 & 2 & 0 \\ -2 & 1 & 1 \\ 3 & 0 & 1 \end{bmatrix}$, please find

(4.1) (3%) the rank of **A**

(4.2) (3%) the determinant of **A**

(4.3) (3%) the trace of **A**

(4.4) (6%) the inverse matrix of **A**

5. Please find the general solution of the following first-order ordinary differential equation

(5.1) (10%) $x\frac{dy}{dx} + 6y = 3xy^{4/3}$

(5.2) (10%) $(6xy - y^3)dx + (4y + 3x^2 - 3xy^2)dy = 0$

6. (10%) Please solve for the following constant coefficient nonhomogeneous differential equation

$$y''' + y'' = 3e^x + 4x^2$$

7. (10%) Please solve for the following initial value problem using the Laplace transform method

$$y'' - y' - 6y = 0; y(0) = 2, y'(0) = -1$$

8. (15%) Find the general solution of the system using the eigenvalue method

$$x_1' = x_1 + 2x_2$$
$$x_2' = 2x_1 + x_2$$

※ 注意：1.考生須在「彌封答案卷」上作答。
2.本試題紙空白部份可當稿紙使用。
3.考生於作答時可否使用計算機、法典、字典或其他資料或工具，以簡章之規定為準。