

Answers to selected questions, 2007 Exam

MATH1014: Introduction to Linear Algebra

Semester 2, 2008

1. (a) (i) $\begin{bmatrix} 5 \\ -11 \\ 1 \end{bmatrix}$ (ii) -2 (iii) $\sqrt{6}$ (iv) $\begin{bmatrix} -7 \\ -3 \\ 2 \end{bmatrix}$
- (b) (i) $\begin{bmatrix} 3 \\ 2 \\ 4 \end{bmatrix}$ (ii) $x = 2 + 3t, y = -1 + 2t, z = 4t$ ($t \in \mathbb{R}$)
- (iii) $2x + 3y + z = 1$
2. (a) (i) $\left[\begin{array}{ccc|c} 1 & -1 & 2 & 6 \\ 1 & 2 & 8 & 9 \\ 2 & 3 & 5 & 26 \end{array} \right]$
- (ii) $x = 11, y = 3, z = -1$
- (iii) $x = y = z = 0$
- (b) $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} -4 \\ 2 \\ 0 \end{bmatrix} + t \begin{bmatrix} -37 \\ 16 \\ 1 \end{bmatrix}, t \in \mathbb{R}.$
3. (a) $d = 7$
- (b) (i) -1 (ii) $\begin{bmatrix} 3 & -4 & 2 \\ -1 & 1 & 0 \\ 0 & 1 & -1 \end{bmatrix}$ (iii) $\begin{bmatrix} 15 & 3 & 4 \\ 16 & 3 & 6 \\ 11 & 1 & 8 \end{bmatrix}$
- (iv) BC is defined, its size is 3×1 .
4. (a) (i) $A\mathbf{u} = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$; eigenvalue = 2. (ii) Any vector $\begin{bmatrix} 2t \\ t \\ 3t \end{bmatrix}, t \in \mathbb{R}, t \neq 0.$
- (b) (i) Eigenvalue: 2. Eigenvector: $\begin{bmatrix} 3 \\ 1 \end{bmatrix}$. (ii) 400
5. (a) $\begin{bmatrix} 0.1 & 0.2 & 0.6 \\ 0.8 & 0.3 & 0.2 \\ 0.1 & 0.5 & 0.2 \end{bmatrix}$ (b) 0.43 (c) $\begin{bmatrix} 46/159 \\ 66/159 \\ 47/159 \end{bmatrix}$
- (d) Approximately 93, 133, 95 at locations 1, 2 and 3 respectively.