

UNIVERSITY of LIMERICK

OLLSCOIL LUIMNIGH
College of Informatics and Electronics

MID-TERM ASSESSMENT PAPER

MODULE CODE: MA4601

SEMESTER: Autumn 2000

MODULE TITLE: Science Mathematics 1

DURATION OF EXAMINATION: 45 minutes

LECTURER: Dr. J. Kinsella

PERCENTAGE OF TOTAL MARKS: 10%

EXTERNAL EXAMINER: Prof. J.D. Gibbon

INSTRUCTIONS TO CANDIDATES: Write the answers to the questions overleaf in the spaces provided. Hand in this sheet at the end of the class.

Name: _____

I.D. Number: _____

1. Given the vectors

$$\mathbf{a} = \langle 8, -1 \rangle \quad \text{and} \quad \mathbf{b} = \langle 1, 11 \rangle, \text{ evaluate } |\mathbf{a}|, 2\mathbf{a} - 4\mathbf{b}.$$

1%

$$\text{Answers: } |\mathbf{a}| = \underline{\hspace{2cm}} \quad 2\mathbf{a} - 4\mathbf{b} = \underline{\hspace{4cm}}$$

2. Given the vectors

$$\mathbf{a} = \langle 8, -1 \rangle \quad \text{and} \quad \mathbf{b} = \langle 1, 11 \rangle, \text{ express } \mathbf{i} \text{ and } \mathbf{j} \text{ in terms of } \mathbf{a} \text{ and } \mathbf{b}.$$

1%

$$\text{Answers: } \mathbf{i} = \underline{\hspace{3cm}} \quad \mathbf{j} = \underline{\hspace{3cm}}$$

3. Two forces
- \mathbf{F}_1
- and
- \mathbf{F}_2
- act at a point. Given that:

$|\mathbf{F}_1| = 3$ and $|\mathbf{F}_2| = 9$ and also that \mathbf{F}_1 makes an angle of 25° with the positive direction of the x -axis and \mathbf{F}_2 makes an angle of 52° with the negative direction of the x -axis, find the magnitude of the resultant $\mathbf{F} = \mathbf{F}_1 + \mathbf{F}_2$ and the angle θ that it makes with the positive direction of the x -axis. **N.B. No calculator needed.**

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$$\text{Answers: } |\mathbf{F}| = \underline{\hspace{2cm}} \quad \theta = \underline{\hspace{2cm}}$$

4. Given the vectors
- $\mathbf{a} = \langle 6, 2, 2 \rangle$
- and
- $\mathbf{b} = \langle 4, 6, 2 \rangle$
- , find the angle
- θ
- between
- \mathbf{a}
- and
- \mathbf{b}
- .

1%

$$\text{Answer: } \theta = \arccos \underline{\hspace{2cm}}$$

5. Solve the linear system

$$\begin{aligned} 2x_1 + 3x_2 &= 21 \\ -x_1 + 2x_2 &= 7 \end{aligned}$$

using either Gauss or Gauss-Jordan Elimination.

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$$\text{Answer: } x_1 = \underline{\hspace{2cm}} \quad x_2 = \underline{\hspace{2cm}}$$

6. Find the solution set for the linear system corresponding to the following augmented matrix (which is in row echelon form).

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$$\left[\begin{array}{cccccc} 1 & 5 & -4 & 0 & -7 & 6 \\ 0 & 0 & 1 & 1 & 7 & 1 \\ 0 & 0 & 0 & 1 & 4 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{array} \right]$$

$$\text{Answer: } x_1 = \underline{\hspace{3cm}} \quad x_2 = \underline{\hspace{3cm}} \\ x_3 = \underline{\hspace{3cm}} \quad x_4 = \underline{\hspace{3cm}} \quad x_5 = \underline{\hspace{3cm}}$$