الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Year	Semester	Paper
DO	1	2	MAIN

MODULE NAME:	**Math 2**		
MODULE CODE:	**DMATH-II**	**EXAM DATE:**	**22.05.2024**
INSTRUCTOR's NAME:	**Dr. Taofeek**	**DURATION:**	**2 hrs.**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Pencil & Calculator	(Incl. cover page)**:** **12**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers should be written **in English.**
- Write all the answers in **blue or black pen only.**
- Use the **pencil** only for **diagrams & graphs.**
- Show all the calculation steps in the given space.
- When finished submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Any cheating/copying may result in an instant failing of the examination.

STUDENT NAME:

STUDENT ID:

FINAL MARKS

	40
	10

Number of answer scripts:……..…….

Invigilator:……..……..…..

Student's signature: ……

Time of receipt:……..…..

Question-1 **[4 Marks]**

If p and q are two vectors where $p = 5i + 3j - k$ and $q = i + j - 3k$. Calculate the angle between the vectors by using scalar product of vectors.

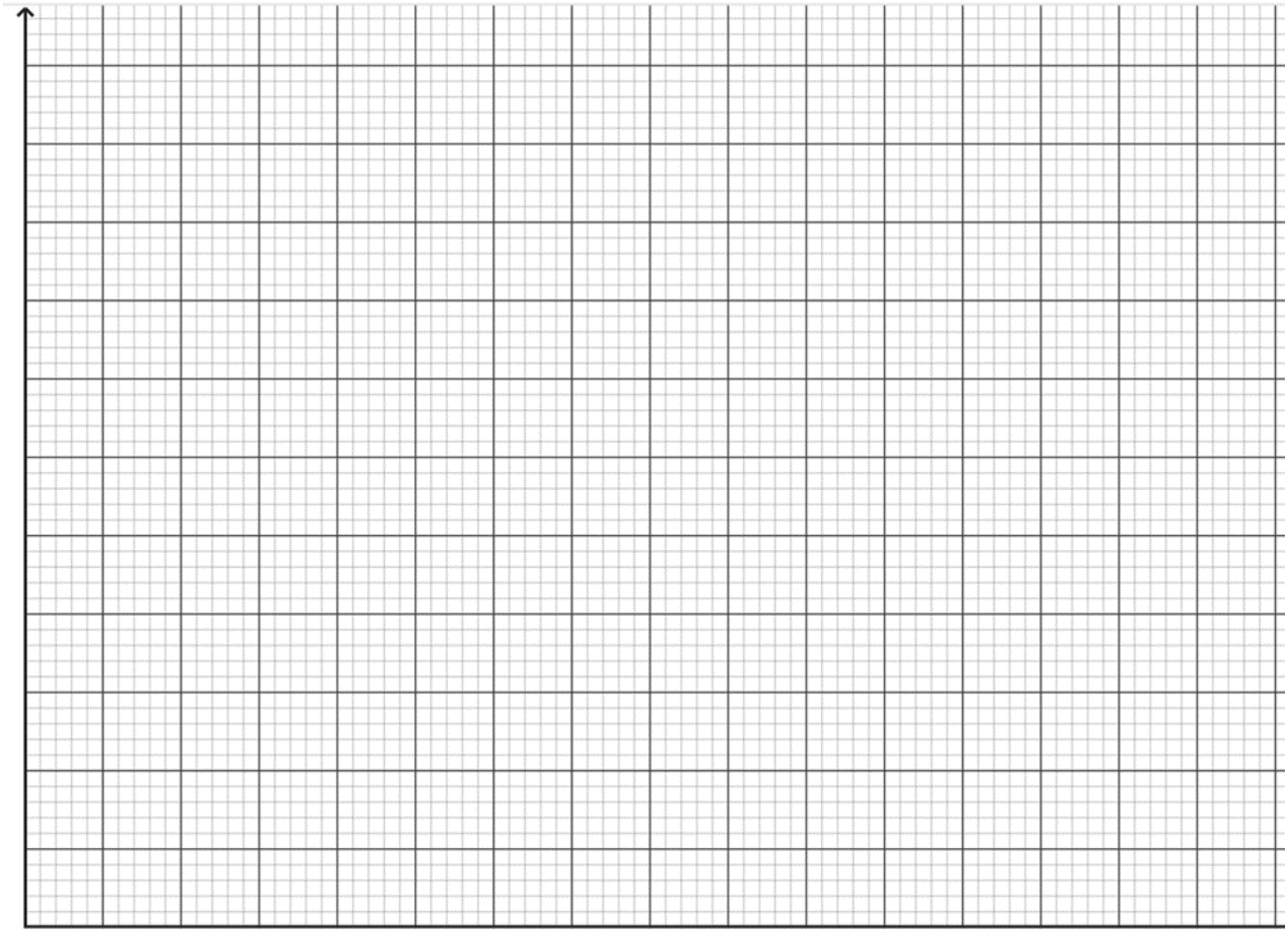
Question-2 **[5 Marks]**

Let $Q(1,1,1)$, $R(4,-3,2)$ and $S(5,0,5)$ be the vertices of triangle ΔQRS, use vector product method to determine the area.

Question-3 **[4 Marks]**

Imagine two ropes are pulling a boat at a dock. One rope pulls with a force of $50 - 15j\ N$, and the other rope pulls with a force of $-15 - 5j\ N$. Find the resultant force, graphically and algebraically.

Note: Use pencil and ruler for all drawings.



Question-4 **[6 Marks]**

Determine the following (3 marks)

a. Evaluate the expression $\frac{-3-j}{2+j}$ and write the result in the form $a + bj$

b. Express the given complex number $\left(1.5\, e^{2.5j}\right)^3$ in polar and rectangular forms. (3 marks)

Question-5 **[4 Marks]**

Apply De Moivre's theorem to calculate the cube roots of the complex number $3j - 8$.

Question-6 **[7 Marks]**

The following is the system of equations for a circuit, where $x, y \; and \; z$ represent currents. Use Cramer's rule to evaluate the three currents.

$$2x - y - z = 7$$
$$x + 2y - 2z = 13$$
$$2x + 3y + z = 9$$

Question- 7 **[4 Marks]**

Let the vectors P and Q have coordinates $(6, 2, 2)$ and $(9, -4, 6)$ respectively.

a. State the position vectors of P and Q. (1 mark)

b. Determine vector $\overrightarrow{PQ}$. (1 mark)

c. State the direction ratios of vector $\overrightarrow{PQ}$. (1 mark)

d. Determine the direction cosines for the vector $\overrightarrow{PQ}$. (1 mark)

Question- 8 **[6 Marks]**

a. Use a table of values to estimate the value of the limit

$$\lim_{x \to 4} \frac{\sqrt{x} - 2}{x - 4}$$

(4 marks)

b. Evaluate the following limit, if it exists (2 marks)

$$\lim_{x\to\infty} \frac{4x^2+1}{2+3x^2}$$

Formula Sheet

1. De Moivre's theorem
   $[r(cos\ \theta + j\ sin\theta)]^n = [r^n(cos\ n\theta + j\ sin\ n\theta)]$

2. Scalar or Dot Product of vectors
   $$a \cdot b = |a||b|\ cos\ \theta$$

3. Vector or Cross product of vectors
   $$a \times b = |a||b|\ sin\ \theta$$

4. Inverse of a matrix
   $$A^{-1} = \frac{1}{|A|} \times \text{adjoint}\ (A)$$

MLO & Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
2, 5	**2, 3, 5**	Application	**9**	
3	**1,**	Understanding/ Analysing	**4**	
4, 8	**4**	Evaluating	**12**	
6	**2**	Analysing	**7**	
1, 7	**1, 3**	Remembering	**8**	
XX				
XX				
XX				
XX				