

Final Exam
MMATH-II: MATH 2
Spring 2026

Points of attention:

- For each question, the maximum earned points are specified in the question.
- Write clearly! Answers that are not readable are not marked and don't earn marks!
- All answers should be written in English using **blue or black pens** only.
- Use the pencil only for diagrams and 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.

Exam Duration: 2 hours
Instructor's Name: Dr. Rokhsaneh Yousef Zehi
Exam Date: 13/05/2026
Program: ME

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Student Information

Name:

ID:

Signature:

Invigilator

Initials:

☐ Student ID checked

Time received:

Question 1**[5 marks]**

Using DeMoivre's theorem determine all the roots of the following equation and express each root in rectangular form.

$$x^3 + 5 = 0$$

Question 2**[6 marks]**

In a chemical mixing process, three solutions A, B, and C are combined to produce a final mixture. The amounts of each solution (in liters) are x , y , and z , respectively. Based on concentration balances, the following system of equations is obtained:

$$x + 2y + z = 7$$

$$2x - y + 3z = 12$$

$$3x + y - z = 5$$

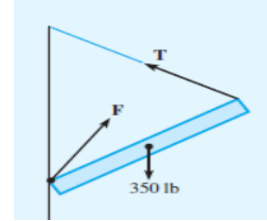
Using **Cramer's Rule**, determine the values of x , y , and z .

Question 3**[5 marks]**

A beam is supported as shown in the figure below. A load of 350 lb acts downward at the end of the beam. From the equilibrium of forces, the following system of equations is obtained:

$$3F - 4T = 0$$

$$4F + 3T = 350$$



- a. Determine the inverse of coefficient matrix using the **Gauss-Jordan Method**.

(3.5 marks)

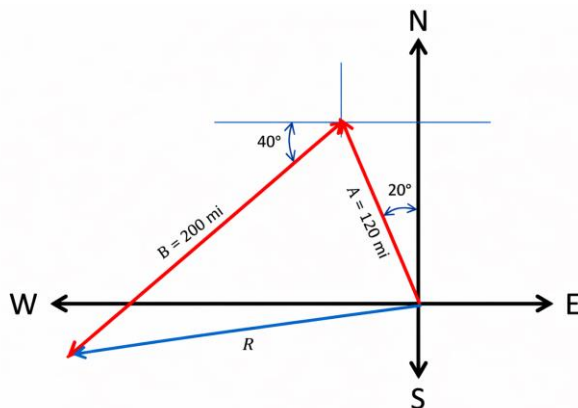
- b. Determine the values of F and T using the **inverse matrix method**.

(1.5 marks)

Question 4**[7 marks]**

A ship leaves a harbor and sails 120 mi at 20° west of north, then changes course and sails 200 mi at 40° south of west.

- a. Determine the x and y –componnet of the resultant displacement vector R from the starting point. (5 marks)
- b. Determine the magnitude and direction of vector R . (2 marks)



Question 5**[5 marks]**

Given that the points A and B have coordinates $A(2, 3)$ and $B(-4, 6)$ respectively, answer the following questions:

- a. State the position vectors of A and B . (1 mark)

- b. Determine the vector $\overrightarrow{AB}$. (1 mark)

- c. Find the magnitude of $\overrightarrow{AB}$. (0.5 marks)

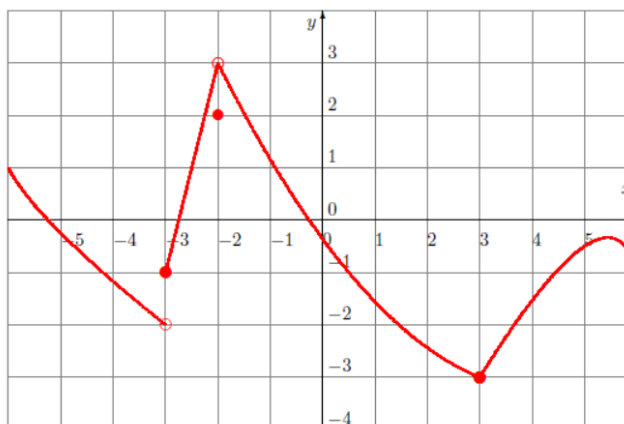
- d. Find the direction ratios of $\overrightarrow{AB}$. (0.5 marks)

- e. Find the scalar product of the position vectors of A and B . (0.5 marks)

- f. Find the angle between the position vectors of A and B . (1.5 marks)

Question 6**[3 marks]**

Consider the following function defined by its graph:



Evaluate the following limits:

a. $\lim_{x \rightarrow -3^+} f(x)$ (0.5 marks)

b. $\lim_{x \rightarrow -3^-} f(x)$ (0.5 marks)

c. $\lim_{x \rightarrow -3} f(x)$ (0.5 marks)

d. $\lim_{x \rightarrow -2^+} f(x)$ (0.5 marks)

e. $\lim_{x \rightarrow -2^-} f(x)$ (0.5 marks)

f. $\lim_{x \rightarrow -2} [f(x)]^2$ (0.5 marks)

Question 7**[9 marks]**

Determine the value of each of the following limits, if they exist. If a limit does not exist, provide a justification.

a. $\lim_{x \rightarrow 4} \frac{x^2 - 16}{\sqrt{x} - 2}$ (4 marks)

b. $\lim_{x \rightarrow \infty} \sqrt{\frac{9x^2 + 1}{2x^2 + 5}}$ (2 marks)

c. $\lim_{x \rightarrow 1} \frac{|2x - 2|}{x - 1} + 1$ (3 marks)

This page is for rough work.

MLO and Bloom's Level of Complexity

Q #	MLO Addressed	Complexity Level	Mark	Remark
1	1,2	Application	5	
2	2,3	Application	6	
3	3,4	Application- Analysis	5	
4	3,4	Application- Analysis	7	
5	1	Understanding -Application	5	
6	1	Understanding -Application	3	
7	1,2	Application-Analysis	9	

References:

Anthony Croft, R. D., 2015. Mathematics for Engineers. Fourth ed. Harlow: Pearson.

J. Washington, A., 2014. Basic Technical Mathematics with Calculus. 10 ed. Harlow: Pearson Education Limited.

Stewart, J., Redlin, L. and Watson, S. (2017) *Precalculus Mathematics for Calculus*. 7th ed. Cengage.