

MTH240 Midterm

Practice/Specimen Paper 1

Toronto Metropolitan University Midterm 1 – Winter 2023

MTH 240

TMU EMAIL: _____

SIGNATURE _____

Date and Time: February XXX, 2023, 6:30 pm

(Time allowed: 120 Minutes)

Section (Circle)						
Instructor 1	1	2	3	4		
Instructor 2	5	6	7	8	9	10
Instructor 3	11	12	13	14	15	16
Instructor 4	17	18	19	20	21	22
Instructor 5	23	24	25	26	27	28

Instructions

1. Calculators, notes, and other aids are not allowed.
2. Answer all questions in this booklet. If you need extra room, use 2 pages, clearly indicating where your answer continues. ANYTHING WRITTEN ON THE BACK OF ANY PAGE WILL NOT BE MARKED.
3. In every question, show your work, presented clearly and in the correct order. Unjustified answers will be given little or no credit.
4. Cross out all irrelevant or incorrect work, as marks may be deducted for work, which is misleading, irrelevant, or incorrect.
5. Make sure your test paper is complete; there are 6 questions on 9 pages (including this one). The final 2 pages are given for extra space and do NOT contain questions.

18 marks

1. (a) Why should a future engineer learn about integration techniques and in particular *improper integrals* (word limit 100)?

(b) Evaluate

$$\int y^2 \cos(5y) dy$$

(c) Evaluate

$$\int \frac{x}{\sqrt{x+8}} dx$$

(d) Evaluate

$$I_n = \int x^n e^{4x} dx$$

7 marks

2. (a) State the product to sum trigonometric identity that may be used to integrate the product of the sin and cos functions different angles.

(b) Evaluate

$$\int \cos(3\theta) \cos(7\theta) d\theta.$$

(c) Evaluate.

$$\int \sin^6(\theta) d\theta .$$

8 marks

3. Evaluate

$$\int \frac{1}{\sqrt{9 - 25x^2}} dx.$$

4. (a) Sunita Patel says $f(x) = \frac{7x^2+11x+13}{(3x+4)(x^2+9)}$ is an **improper fraction**. Comment on the statement as a feedback to Sunita.
- (b) State the partial fraction decomposition form of $f(x) = \frac{7x^2+11x+13}{(3x+4)(x^2+9)}$.
- (c) Find the constants in the partial fraction decomposition form, and **hence** write $f(x)$ as a sum of partial fractions.
- (d) Using your answer in (c) show that

$$\int_0^3 f(x)dx = \frac{1}{3} \ln 26 + \frac{\pi}{12}.$$

10 marks

5. (a) Evaluate the following integral.

$$\int \frac{1}{a^2 - x^2} dx.$$

- (b) Show whether the following integral converges or diverges.

$$\int_0^a \frac{1}{a^2 - x^2} dx.$$