Department of Mathematics, IIT Madras

MA-5105-Scientific Computing & Advanced Programming Lab

Practice Problems 2

August 12, 2026

Lecturer: Saurav Samantaray *TA: Rohit Kumar Mani*

Q. 1 Electricity Bill

A household electricity meter records the monthly electricity consumption in units (kWh). The electricity company charges according to the following tariff:

- For the first 100 units, the charge is ₹2 per unit.
- For units 101–200, the charge is ₹3.50 per unit.
- For units 201–500, the charge is ₹5 per unit.
- For consumption above 500 units, the charge is ₹7 per unit.

In addition, if the total bill exceeds ₹2000, a surcharge of 10% is added.

(a) Write a Python program that asks the user for the monthly electricity consumption and calculates the final bill.

(b) Your program should also handle the case where the user enters a negative consumption.

Q. 2 Student Performance

A student receives marks in three subjects: Mathematics, Programming, and Statistics.

Write a Python program that accepts the three marks and determines the student's final result.

The program should report:

- the average mark,
- whether the student has passed or failed,
- and the corresponding grade.

Use the following grading system:

Average	Grade
$90 - -100$	A
$80 - -89$	B
$70 - -79$	C
$60 - -69$	D
$50 - -59$	E
< 50	F

- A student must obtain at least 40 marks in every individual subject to pass, regardless of the average.
- The program should also detect invalid marks, such as marks below 0 or above 100.

Q. 3 Quadratic Equation

Consider the quadratic equation

$$ax^2 + bx + c = 0.$$

Write a Python program that asks the user to enter a, b, and c, and determines the solutions of the equation.

Your program should correctly handle all of the following situations:

- $a = 0$,
- two distinct real solutions,
- one repeated real solution,
- no real solutions.

For example, the program should be able to deal with equations such as

$$x^2 - 5x + 6 = 0,$$

$$x^2 - 4x + 4 = 0,$$

and

$$x^2 + 2x + 5 = 0.$$

Challenge: Do not use any additional Python package for calculating the square root. Use the exponentiation operator available in Python.