



Addis Ababa Science and Technology University
Department of Mathematics
Mathematics for Natural Sciences (Math-1007)
Group Assignment-II

Submission Date: May 26, 2023 Academic year 2022/23, I Semester Max mark: 10%

Make a group of 4–7 students and solve the following problems showing all the necessary steps clearly.

1. Use all the necessary steps to sketch the graph of the rational function $f(x) = \frac{x^3 + 2x^2 + x}{x^2 - x - 2}$

2. The amount of a radioactive element at time t is given by the formula

$$A(t) = A_0 e^{kt}, \quad (1)$$

where $A(0) = A_0$ is the initial amount of the element and $k < 0$ is the constant of proportionality which satisfies the equation (instantaneous rate of change of $A(t)$ at time t) = $kA(t)$.

Iodine–131 is a commonly used radioactive isotope used to help detect how well the thyroid is functioning. Suppose the decay of Iodine–131 follows the model given in Equation (1), and that the half–life of Iodine–131 is approximately 10 days. If 5 grams of Iodine–131 is present initially, find a function which gives the amount of Iodine–131, A , in grams, t days later, and then after 20 days.

3. The cable of a uniformly loaded suspension bridge hangs in the form of a parabola. The roadway which is horizontal and 100m long is supported by vertical wires attached to the cable, the longest wire being 30m and the shortest being 6m. Find the length of a supporting wire attached to the roadway 18m from the middle.

4. Jamila and John want to exchange secrets (terrible secrets) from across a crowded whispering gallery. Recall that a whispering gallery is a room which, in cross section, is half of an ellipse. If the room is 40 feet high at the center and 100 feet wide at the floor, how far from the outer wall should each of them stand so that they will be positioned at the foci of the ellipse?