

Due on 13 November 2021

M.Sc. Data Science
Analysis - Computing assignment 2

Note:

- Please submit your assignment in the following filename format: (first name)(assignment number).m or .py; for example, a student named xyz will submit assignment 1 using the filename xyz1.m;
- all assignment submissions should be uploaded on Moodle.
- For all the following exercises you may refer to the sympy, scipy and matplotlib documentations.

1. (a) Write a program that will allow the user to input any two single-variable functions of x and print the enclosed area between the two. The program should mention that the first function entered should be the upper function, and it should also ask for the values of x between which to find the area.

(b) Plot the functions given by the user.

2. The possible scores on a certain math quiz are between 0 and 20. The function $p(x) = \frac{1}{\sqrt{2\pi}} e^{-\frac{(x-10)^2}{2}}$ describes the probability of obtaining the grade x , where $0 \leq x \leq 20$. What is the probability of a student getting a grade between 11 and 12? Calculate the answer using the required sympy function.

3. Use sympy to generate the Taylor series for the functions near $x = 0$. Plot the graph of the given function and of the Taylor polynomials (of various degrees). Evaluate the function at $a = 2$ using the Taylor polynomial. (We will work out a similar example in class.)

(a) $f(x) = \ln(1 + x) + 2 \tan x$

(b) $g(x) = \sin x + 3e^x$

4. Write a function that checks the continuity of a given function at a given point as follows: the program should (1) accept a single-variable function and a value of that variable as inputs and (2) check whether the input function is continuous at the point where the variable assumes the value input.

Recall that for a function to be continuous at a point, the function must be defined at that point and its left-hand limit and right-hand limit must exist and be equal to the value of the function at that point.