Lab 20

Ch En 263 – Numerical Tools

Due: 25 Nov. 2025

Instructions

- Complete the exercise(s) below, and submit the following files to Learning Suite:

  - Submit a *single Jupyter Notebook file* for this homework. Format your Lab with markdown cells to label each problem.

- Warning: the LS assignment will close promptly at 11:59 pm and late assignments will only receive 50% credit.

Lab Exercises

1. Do the following using the symbolic module in Python.

   (a) Simplify the expression:
   $$\frac{x^2 - x - 6}{x^2 - 3x}.$$

   (b) Expand the expression:
   $$(x + 1)^3 (x - 2)^2.$$

   (c) Factor the expression:
   $$3x^4 - 36x^3 + 99x^2 - 6x - 144.$$

   (d) Compute the symbolic derivative:
   $$\frac{d}{dx} \sin^2(x)e^{2x}.$$

   Then evaluate the resulting expression for $x = 3.3$.

   (e) Evaluate the integral:
   $$\int_0^5 x^2 \sin(x^2) \, dx.$$

   Hint: For the integral, you may get gamma functions (Γ) and/or Fresnel integrals (C) .

2. Numerically evaluate the integral from above using `scipy` functions
   $$\int_0^5 x^2 \sin(x^2) \, dx.$$