

SHOW ALL WORK!

Problem 1 (35 pts)

Consider the definite integral

$$I = \int_a^b f(x) dx \quad \text{where } a=0, b=1 \text{ and } f(x)=e^{-x^2},$$

A) Use Simpson's Rule with 8 intervals to approximate I. Fill in the table below with $f(x_i)$ rounded to 4 places after the decimal point. Express your answer to 4 places after the decimal point.

i	x_i	$f(x_i)$
0	0.0000	
1		
2		
3		
4		
5		
6		
7		
8	1.0000	

B) Use the Gauss Quadrature two point formula to approximate I. Express your answer to 4 places after the decimal point.

SHOW ALL WORK!

Problem 2 (35 pts)

The following data points were obtained experimentally.

x_i	y_i
1	0
2	2
5	17
7	34
10	85

A) Find the Normal Equations used to solve for a_0 and a_1 in the Least Squares Line:

$$y = a_0 + a_1x$$

B) Find the coefficient of determination (to 4 places after the decimal point) of the Least Squares Line.

SHOW ALL WORK!

Problem 3 (30 pts)

Examine the following system of equations and determine whether they are consistent. If they are inconsistent, show why. If they are consistent and there is a unique solution, find it. If they are consistent and there are one or more arbitrary unknowns, determine if x_2 can be arbitrary.

$$\begin{aligned}x_1 + x_2 + x_3 - 3x_4 &= 2 \\-x_1 + x_3 - x_4 &= 1 \\2x_1 - x_2 + 3x_3 - 8x_4 &= 2 \\x_2 + x_3 - 2x_4 &= 2\end{aligned}$$