

# Numerical Analysis Homework 3

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## Problem 1

Computation

Verifying Correctness

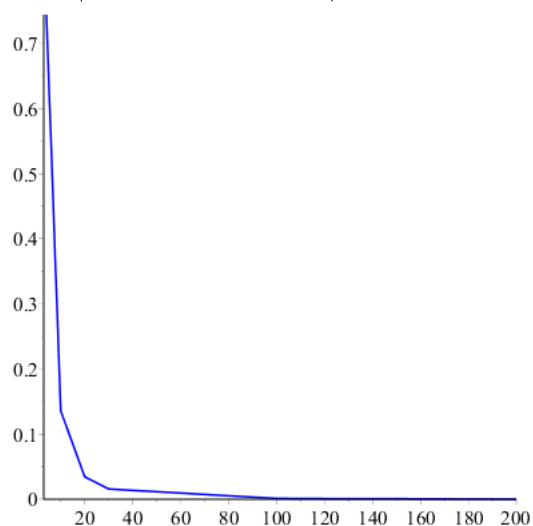
## Problem 2

5 Point Stencils

Simpson's Rule

Actual value of  $\int_0^\pi \sin x \cdot e^{\cos x} dx$  : 2.350402.

n	Simpson's Result	Absolute Error
4	1.606199	.744203
10	2.215001	.135401
20	2.315927	.034475
30	2.334574	.015828
100	2.349178	.001224
200	2.350407	.000005



## Analysis

Simpson's method remained fairly stable despite the noise, with the error showing a clear exponential decay as  $n$  increased, and achieving  $10^{-5}$  accuracy at  $n = 200$ .

## Problem 3

Simpson's Method Integration	0.316200
Trapezoid Method Integration	0.318500
Total Emitted Energy from Magnitude Spline	$64.469777 \cdot L_{\odot}$
Total Emitted Energy from Luminosity Spline	$64.476557 \cdot L_{\odot}$

## Problem 4

Median Photon Energy

Mean Photon Energy

Standard Deviation in Wavelength

## Problem 5

a.)  $\int_{-1}^1 \cos^2 x dx$   
Actual value: 1.4546  
Romberg 3,3 Value: .868757

b.)  $\int_{-\frac{3}{4}}^{\frac{3}{4}} x \ln(x+1) dx$   
Actual value: .324332  
Romberg 3,3 Value: .270399

c.)  $\int_1^4 \sin^2 x - 2x \sin x + 1 dx$   
Actual value: 1.3668  
Romberg 3,3 Value:

d.)  $\int_e^{2e} \frac{1}{x \ln x} dx$   
Actual value: .52659  
Romberg 3,3 Value: .382850

## Problem 6