Numerical Analysis Homework 3

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1 Composite Quadrature

1.1 1a

Solved. run ex1a.m

1.2 1b

run ex1b.m
The convergence rate for composite midpoint method is approx. 2
The convergence rate for composite trapezoidal rule is approx. 2
The convergence rate for composite Simpson rule is approx. 4

For all methods as h becomes smaller, the error also reduces proportianlly. the reduction is faster in simpson's method by approximately 2 times as shown in the images. fig. 1 , 2 3.

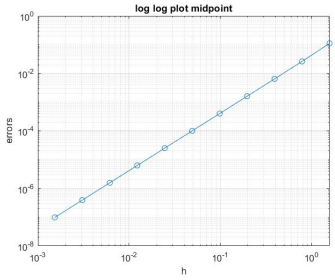

Figure 1: log-log plot of composite midpoint method

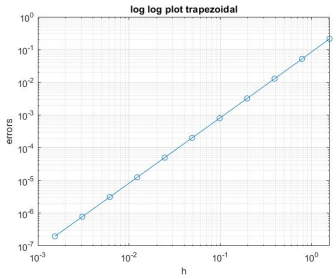

Figure 2: log-log plot of composite trapezoidal method

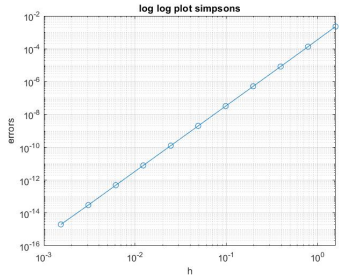

Figure 3: log-log plot of composite simpson's method

1.3 1c

run ex1c.m
convergence rate reduces to approx 1 if a mistake is made. As show in the fig. 4. and calculated in ex1c.m

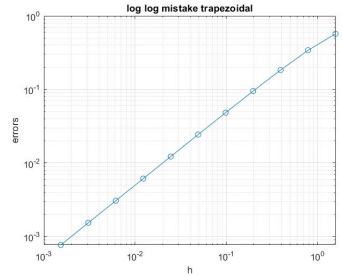

Figure 4: log-log plot of mistake trapezoidal method

2 Numerical integration

2.1 a

run ex2a.m

2.2 b

solved. run ex2b.m
decay rate for euler method is 2
decay rate for backwards euler method is 2
decay rate for crank-nicholson method is 4