

Numerical Analysis and Visualization

Homework 1

April 3, 2017

1. Consider a function $f(x) = \cos x$.
 - (a) Determine the second and the third Taylor polynomials about $x_0 = 0$.
 - (b) Use the above two Taylor polynomials to approximate $\cos(0.01)$ and analyze the errors against the accurate value.
 - (c) Use the third Taylor polynomial and its remainder term to approximate $\int_0^{0.1} \cos x dx$.
2. The number e can be defined by $e = \sum_{n=0}^{\infty} (1/n!)$. Compute the absolute error and relative error in the approximation of e : $\sum_{n=0}^5 \frac{1}{n!}$.
3. Use three-digit chopping arithmetic to compute the sum $\sum_{i=1}^{10} (1/i^3)$ first by $\frac{1}{1} + \frac{1}{8} + \dots + \frac{1}{1000}$ and then by $\frac{1}{1000} + \frac{1}{1} + \dots + \frac{1}{1}$. Which method is more accurate, and why?