CSS 455 Winter 2012 C. Jackels
Activity Answer No. 7 February 11, 2012

In Exam 1, you considered the N-term Taylor series approximation (k=0:N-1) for exp(x) (e^x). For x=4, the result for the error bound was

N	8	9	10
f(4) exact	54.598	54.598	54.598
Rel Error %	5.95%	2.38%	0.88%

With 8 terms, the series result has a relative error upper bound of 5.95%. By increasing to 10 terms, the error bound drops to 0.9%.

Download the demo m-file *ExpTaylorTerm.m* from "set 4" to use here with Matlab. When called as *y = ExpTaylorTerm(x, n),* y is the n-term approximation to exp(x).

1. To be sure that you know how to invoke this function, use Matlab: to calculate the 8-term approximation to exp(4), to calculate the exact answer exp(4), and to report the relative error abs((exact-approx)/(exact)). 54.598150033144236; 51.806349206349203
   Your relative percentage error should be less than the bound above but greater than 5%.. Write it down:
   5.11%
2. Calculate the 8-term approx to exp(2) with the function provided. What is the relative (in percentage) error of this result: *7.381; 7.3891*
   0.11%
3. Directly from this result for exp(2), obtain an estimate of exp(4) and calculate its relative (in percentage) error. (*Do not call ExpTaylorTerm for x=4 here.)*
   54.478458049886612 error =0. 219%

4. Calculate the 8-term approx to exp(1) with the function provided. What is the relative (in percentage) error of this result:
   2.718253968253968; 2.718281828459046 error = 0.001%

5. Directly from this result for exp(1), obtain an estimate of exp(4) and calculate its relative (in percentage) error. (*Do not call ExpTaylorTerm for x=4 here.)*

54.595911718844881 error = 0.004%

See reverse side