Computational Fluid Dynamics (AE/ME 339)
MAEEM Dept., UMR, Fall 2001

Home Work Problem 3 (RAM5)

Given that $f = y(x + 2^x)$, do the following:

a) Using values of f from the above equation, calculate the backward, forward and central difference approximations of $\frac{\partial f}{\partial x}$ at x=1, y=1 for Δx values of 1.0, 0.5, 0.25, 0.1, 0.05, and 0.01. Report your results by constructing a table showing, for each value of Δx, the values of $f(x - \Delta x)$, $f(x + \Delta x)$ and the three finite difference approximations.

b) Using the equation for *f* to find the actual value of the first derivative at (1,1), plot the error (defined as the difference between the exact value of the derivative and the finite difference approximation value) as a function of Δx for each type of difference, *using a linear plot.*

c) Use the equation for *f* to determine the value of the first term truncated, as a function of Δx, for each of the three differences. Compare the values of these terms with the errors found in b) and discuss the extent to which the first term truncated provides an accurate representation of the error.