ASSIGNMENT 10

Due April 27, 2004 (before start of class)

Problem 10

Given a sufficiently smooth function $f : \mathcal{R} \rightarrow \mathcal{R}$, use Taylor series to derive a fourth-order accurate formula for $f'(x)$ in terms of the values of $f(x)$, $f(x \pm h)$, and $f(x \pm 2h)$, with a chosen step size h.

Use the formula that you have just derived for $f'(x)$ to compute the first derivative of $\sin(x)$ at $x = 1$ using a step size of $h = 0.5$. Repeat the calculation using a step size of $h = 0.25$. Use Richardson extrapolation to produce a better estimate of the result. Comment on the errors that you get.

Submit a hardcopy of your work, a copy of your Matlab program, and the results. But do not submit an electronic copy of your program.