Physics 503: Scientific Computing

Homework #5

Topic: Numerical Differentiation

Due: Friday Mar. 9th by midnight.

Assignment

1. Compare the errors for the central, forward, backward difference methods for stencil (h) values with a range of values between [1e-7:1e-1] by computing the derivative of $f(x) = x\sin(2x)$ for the range x=[0:5] and comparing with the exact value. Plot the computed and exact values together on a plot with a legend showing the h value.
2. Generate a "noisy" set of data with a base function of $f(x) = \exp(-2x)\cos(3x)$ over some reasonable range for x. Use the meshderiv function to compute the 1st derivative of that noisy data and plot both the function and it's derivative. In a separate figure, plot the derivative on the noisy data that has been smoothed for a range of smoothing levels (say 2-4).