Matlab Homework 4c

The same requirements as for homework 3c apply.

1. We continue the problem of homework 3, where we measured a function f that, "unknown to us," is exactly equal to $f_{\text{exact}}(t) = \sin(t)$. We did nine measurements at equally spaced times from -3.2 to 3.2. Determine what the measured f-values would have been assuming that the 9 measurements have random errors of about 10%. In particular, Matlab users create the measured data as follows:

   ```
   rng('default')
   fMeasured=fExactFun(tMeasured)+0.1*randn(size(tMeasured));
   ```

   Octave creates different random numbers than Matlab, so Octave users should instead use

   ```
   fMeasured=fExactFun(tMeasured)+0.1*...
    [0.54 1.83 -2.26 0.86 0.32 -1.31 -0.43 0.34 3.58]';
   ```

   to ensure that they get comparable results. Repeat the example interpolations/extrapolations and the plot of the interpolations that you made last homework, but now using the new inaccurately measured data. Restrict the vertical axis to the range from -3 to 3 (and as always, the horizontal axis from -5 to 5). Set the x-axis location at the origin and use appropriate legend, title and labels. Comment on the quality of each result, after getting it, using the `disp('blah blah')` command. Also print the maximum error in each interpolation type at 100 points from -3.2 to 3.2 (i.e. excluding the extrapolated values). Comment using the `disp('blah blah')` command.

2. Next try fitting a straight line (red), a cubic (green), and a quintic (blue) to the data. Plot all three results together, against exact and measured as in the previous question, and again restricting the axes to the given ranges. For each plot, comment on the quality using again the `disp('blah blah')` command. Print again the maximum errors between -3.2 and 3.2.

   Repeat the plot and errors when you have 50 measurements instead of just 9. *Warning*: be sure to recreate all data that will have changed, like the measured function values. Octave users can now use `randn` like the Matlab ones (but skip `rng`). With this many points, it should not make much of a difference.

   Note: you need to split this into questions 2a and 2b, otherwise the first plot will disappear (at least in Octave, it will).

3. Find the derivatives of the three fitted polynomials and plot them all three together (red, green, blue) against the exact derivative (as a black dashed line). Use similar plot features as before. Comment on the quality of each of the three approximations using again the `disp('blah blah')` command. Use appropriate title, labels, and use horizontal and vertical axis ranges from -5 to 5.