Armstrong State University
Engineering Studies
MATLAB Marina – Curve Fitting Exercises

1. Briefly explain how curve fitting can be used to estimate unknown values in a set of data. Briefly explain when the estimated values from curve fitting are likely to be more accurate than estimates from interpolation. Briefly explain two other uses of curve fitting besides estimating unknown values in a set of data.
2. Write a MATLAB program that will:
   - Determine the best fit polynomial functions of degree 1, 3, and 5 for the data generated by the MATLAB code segment of Figure 1.

```
tnoisy = [0.0: 0.25 : 10.0];
noise = 0.0 + (0.5 - 0.0)*rand(1,length(tnoisy));
fnoisy = 5*tnoisy.*exp(-0.5*tnoisy) + noise;
```

Figure 1, MATLAB Code Segment to Generate Noisy Data

   - On the same axes in a figure window, plot the original data using blue circles for the points (no line), plot the best fit polynomial functions using a green solid line for the degree 1 polynomial function, a red solid line for the degree 3 polynomial function, and a cyan solid line for the degree 5 polynomial function. Use the same time vector, `tnoisy`, to evaluate the best fit polynomial functions for the plot. Appropriately title and label your plot.
   - Determine the sum of squared error for each of the fitted curves.
3. Write a MATLAB program that will:
   - Load measured capacitor voltages from a RC circuit from the Microsoft Excel file `capVoltage.xlsx`.
   - Estimate the value of the capacitor voltage at $t = 0.065$ seconds.
   - Extrapolate the value of the capacitor voltage at $t = 0.3$ seconds.
   - Determine the best fit polynomial function describing the capacitor voltage.
   - Use the best fit polynomial function describing the capacitor voltage to estimate the value of the capacitor voltage at $t = 0.065$ seconds and at $t = 0.3$ seconds.
   - Plot the original capacitor voltage data and the best fit polynomial function describing the capacitor voltage on the same axes. How well does the best fit polynomial function match the measured capacitor voltage data?

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