Homework #5

MAE 316 Analysis of Engineering Systems
West Virginia University
Mechanical and Aerospace Engineering Department
Fall 2006
Instructor: Prof. Ismail Celik

Due date: Tuesday 11/07/2006

Problem: In the attached excel spreadsheet is the data of the stress-strain relationship for a Aluminum 6061-T6 (courtesy of Dr. Kang, Mae 344 Materials and Structures lab).

I. Fit the following curves to this data using least squares analysis and discuss the accuracy of each considering the trend of the original data as well as the sum of the square of the errors between experimental and curve-fitted data:

\[
\begin{align*}
\sigma &= a \varepsilon^b \\
\sigma &= a_0 + a_1 \varepsilon^b \\
\sigma &= a \varepsilon^{bc} \\
\sigma &= a_o + a_1 \varepsilon + a_2 \varepsilon^2
\end{align*}
\]

II. Calculate \( \frac{d\sigma}{d\varepsilon} \) at \( \varepsilon = 40666 \) for each curve derived in part I, as well as by finite difference. Compare and discuss the results.