Case Study Homework #1, Due Friday, Sept. 16

Background:

A scientist has a theory. The theory says that the results of an experiment should be related by a function $y = f(x)$ where f is of the form $f(x) = ae^{bx} + ce^{dx}$ for some constants a, b, c and d.

Problem:

Given a set of experimental data (x_i, y_i), $i = 1, \ldots, n$, find values for the parameters a, b, c and d.

Considerations:

The data is not exact.

Besides finding values for the parameters, some check of their validity is needed.

Exercises:

1. Come up with two different objective functions and compute the gradient of each.
2. Determine a way to form an initial guess.
3. Answer these application questions but don't go too deep:
   (a) Just because there is a solution doesn't mean the theory is valid. Why?
   (b) How could we identify that the theory is valid or not valid?
   (c) Under what circumstances would the results neither confirm or deny the theory?