1. Consider the limited memory quasi-Newton method using the DFP update formula with $C(0) = I$:

$$C(k+1) = C(k) - \frac{C(k) y(k) y(k)^T C(k)}{y(k)^T C(k) y(k)} + \frac{s(k) s(k)^T}{y(k)^T g(k)}$$

As an example, let $k = 2$.

a. (5) What vectors would you store in order to be able to form $C(3)v$ for an arbitrary vector $v$?

b. (5) How many floating-point multiplications would it take to form $C(3)v$?
2. (10) Suppose we measure \( y(t_i), i = 1, \ldots, 100 \), and we model the relationship between \( t \) and \( y \) by

\[
y_{\text{pred}}(t) = x_2 e^{x_1 t}
\]

for some parameters \( x_1 \) and \( x_2 \). We want the “optimal” parameters, the values that minimize the least squares error:

\[
\sum_{i=1}^{n} (y(t_i) - y_{\text{pred}}(t_i))^2.
\]

Consider minimizing this function using \texttt{fmin}, a MATLAB-supplied function that minimizes a function of a \texttt{single} variable, or \texttt{fminunc}, a MATLAB-supplied function that minimizes a function of a vector of variables.

Write a MATLAB function \texttt{fcomp = f(x1)} that will evaluate the function to be minimized by \texttt{fmin}. (If you don’t know how to do this, then for a maximum of 5 points, write a MATLAB function \texttt{fcomp = f(x)} to be used by \texttt{fminunc}.)