1. Write a Matlab program that uses Lagrangian interpolation for a given set of data $x_i, y_i$, $i = 0, 1, 2, ..., n$. Then using the program estimate $f(0.33)$ where

$$
\begin{array}{c|c|c}
  i & x & f(x) \\
  \hline
  0 & 0.0 & 1.728 \\
  1 & 0.2 & 0.720 \\
  2 & 0.4 & -0.320 \\
  3 & 0.6 & 0.000 \\
  4 & 0.8 & 0.000 \\
  5 & 1.0 & -1.232 \\
\end{array}
$$

Table 1

2. Determine the coefficients of the polynomial of degree 5 that collocates the data in Table 1. Then, using the polynomial found, confirm the result obtained in Question 1.

3. Using the principle of least square, fit to the data in Table 1:
   (a) a line, and
   (b) a parabola.
   Plot the graphs obtained in (a) and (b) by using Matlab, and show the relative locations of the given data with respect to these graphs.

4. Construct a spline fit to the data in Table 1 with the end conditions $y'(0) = y'(5)$ and $y''(0) = y''(5)$. Plot the spline and show how it collocates the given data.

5. Magik spline. Write a Matlab program which evaluates a closed spline curve that passes through $n$ points. Then using the program, plot the spline passing through the points $ADBECA$ of the pentagon shown in Figure 1(a).
   Choosing the curve tool in PowerPoint, see Figure 1(b), and following the path $ADBECA$ in the pentagon of Figure 1(a), yields the drawing shown in Figure 1(c). Do you think that PowerPoint is using a spline algorithm that is similar to the one that you have just implemented? Explain.

(a)                                           (b)                                            (c)

Figure 1