Open Matlab and *move to the Desktop or to a folder where you can find your work* at the end of the session. Type these lines

```
>> diary myworkApril25
>> format long
>> format compact
```

1. Matrix review:

   (a) Introduce the following matrix in Matlab.

$$
A = \begin{bmatrix}
2 & -1 & 0 & 0 & 0 \\
-1 & 2 & -1 & 0 & 0 \\
0 & -1 & 2 & -1 & 0 \\
0 & 0 & -1 & 2 & -1 \\
0 & 0 & 0 & -1 & 2
\end{bmatrix}
$$

   (b) Select its third row

   (c) Select its fourth column.

2. If you want to solve a linear system

$$
\begin{bmatrix}
2 & -1 & 0 & 0 & 0 \\
-1 & 2 & -1 & 0 & 0 \\
0 & -1 & 2 & -1 & 0 \\
0 & 0 & -1 & 2 & -1 \\
0 & 0 & 0 & -1 & 2
\end{bmatrix}
\begin{bmatrix}
x_1 \\ x_2 \\ x_3 \\ x_4 \\ x_5
\end{bmatrix}
=
\begin{bmatrix}
-1 \\ 2 \\ 3 \\ 2 \\ 4
\end{bmatrix}
$$

   you get `A` as before, copy the right hand side as a column vector

```
>> b=[-1;2;3;2;4]
>> b=[-1 2 3 2 4]'     % both options give the same result
```

   and then we just go ahead and let Matlab solve with the backslash command.

```
>> A\b
ans =
   3.333333333333334
   7.666666666666670
  10.000000000000002
   9.333333333333332
   6.666666666666665
```

3. Let us repeat the previous exercise with a $N \times N$ system

$$
\begin{bmatrix}
2 & -1 & 0 & 0 & 0 \\
-1 & 2 & -1 & 0 & 0 \\
0 & -1 & 2 & -1 & 0 \\
0 & 0 & \ddots & \ddots & \ddots \\
0 & 0 & 0 & -1 & 2
\end{bmatrix}
\begin{bmatrix}
x_1 \\
x_2 \\
x_3 \\
\vdots \\
x_N
\end{bmatrix}
=
\frac{1}{(N+1)^2}
\begin{bmatrix}
f(t_1) \\
f(t_2) \\
f(t_3) \\
\vdots \\
f(t_N)
\end{bmatrix}
$$

where

$$
f(t) = t^2 - 2t + 1, \qquad t_i = \frac{i}{N+1} \qquad i = (0), 1, \ldots, N, (N+1).
$$

Write a script that does all the following:

(a) Create the matrix. (Learn how to use the function `diag` in Matlab to do that.)

(b) Define the right-hand side.

(c) Solve the system.

(d) If x is the solution, create the vector `x=[0;x;0]` and plot it in the y axis with t_i (for $i = 0, \ldots, N + 1$ in the x axis.