Exercise 1: Basic Matrix Operations
Define the following matrices and vectors.

$$A = \begin{pmatrix} -4 & 2 \\ 2 & 1 \end{pmatrix}, \; B = \begin{pmatrix} 2 & -1 \\ 1 & -2 \end{pmatrix}, \; C = \begin{pmatrix} 1 & -3 & 2 \\ 1 & -9 & -4 \end{pmatrix}, \; D = \begin{pmatrix} 1 & 2 \\ 1 & -3 \\ -2 & 3 \end{pmatrix},$$

$$\boldsymbol{x} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \; \boldsymbol{y} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \; \boldsymbol{z} = \begin{pmatrix} 2 \\ -4 \\ 1 \end{pmatrix}.$$

Calculate the following:

(a) A - B,

(b) $4\boldsymbol{x}$ - $2\boldsymbol{y}$,

(c) A$\boldsymbol{y}$,

(d) A($\boldsymbol{y}$ + $\boldsymbol{x}$),

(e) D$\boldsymbol{x}$,

(f) D$\boldsymbol{y}$ + $\boldsymbol{z}$,

(g) AB,

(h) BA,

(i) AC,

(j) CD.

Save the answers in ten separate .dat files, named **A1.dat**, **A2.dat**, ..., **A10.dat**.
Are the answers in (g) and (h) the same? Why or why not?
    Next, access and save the following elements:

(k) The second column of C,

(l) Both columns of the last two rows of D,

(m) The first two columns of the second row of C.

Save the answers in three separate .dat files, named **A11.dat**, **A12.dat** and **A13.dat**.

Exercise 2: Truncation Errors
The following four expressions are exactly equal to zero:

$$x_1 = \left| 1000 - \sum_{k=1}^{10,000} 0.1 \right|, \quad x_2 = \left| 1000 - \sum_{k=1}^{8,000} 0.125 \right|,$$

$$x_3 = \left| 1000 - \sum_{k=1}^{5,000} 0.2 \right|, \quad x_4 = \left| 1000 - \sum_{k=1}^{4,000} 0.25 \right|$$

However, computers store floating-point numbers with a binary representation, so most decimals representations have a small truncation error. This error accumulates in the summation of a series. As a result, x and y might not be numerically identical to zero. To verify this effect, use MATLAB to compute x and y. Save $[x_1, x_2, x_3, x_4]^T$ as a column vector in **A14.dat**. **Hint:** Use a **for** loop.

Can you explain the differences in these values?