1. In MATLAB, input the following matrix，and use this matrix to answer the following questions :

$$\mathbf{A} = \begin{bmatrix} 3 & 7 & -4 & 12 \\ -5 & 9 & 10 & 2 \\ 6 & 13 & 8 & 11 \\ 15 & 5 & 4 & 1 \end{bmatrix}$$

a. Construct a 4 × 3 matrix **B**，its elements is the second column through 4-th column of A.
b. Construct a 3 × 4 matrix **C**，its elements is the second row through 4-th row of A.
c. Construct a 2 × 3 matrix **D**，its elements is the first two rows and last three columns of A.

2. In MATLAB, find the length and absolute value of the following vectors:
   a. **x** = [2, 4, 7]
   b. **y** = [2, –4, 7, -6]

3. Construct following matrix A and let B=ln(A'):

$$\mathbf{A} = \begin{bmatrix} 1 & 4 & 2 \\ 2 & 4 & 100 \\ 7 & 9 & 7 \\ 3 & \pi & 42 \end{bmatrix}$$

   Use MATLAB to find the following:
   a. Construct a matrix **C**，it is the transpose of A.
   b. Construct a matrix **D,** deleting **2-nd row of A.**
   c. Add a column with values 1 to the 2-nd column of D.
   d. Extracting 1st and 3th column of A and put it into the matrix E.
   e. Construct vector **x,** its elements is the only second row of **B**.
   f. Calculate the sum of all the elements of **x.**
   g. Pointwise multiplication of the 2-nd row of A and 3-th column of B.
   h. Pointwise multiplication of the 1st row of A and 3-th column of B.
   i. Find the maximum, minimum and summation values of the resulting vector in h.

4. The following table shows the cost of a product and the output of the four seasons for each business year. Using MATLAB to find (*a*) the cost of materials, labor, and transportation for each season. (b) the total cost of materials, labor, and transportation for each year. And (*c*) total costs of each season.

Cost of a product ($*1000)

product	materials	labor	transportation
1	7	3	2
2	3	1	3
3	9	4	5
4	2	5	4
5	6	2	1

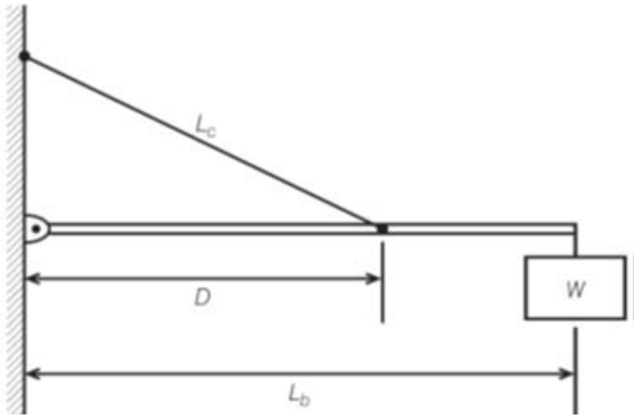
Total number of product for each season

Product	1^{st} season	2^{nd} season	3^{th} season	4^{th} season
1	16	14	10	12
2	12	15	11	13
3	8	9	7	11
4	14	13	15	17
5	13	16	12	18

5. Cables of length L_c support a beam column of length L_b that remains level when the end of the beam column hangs an object with weight W. According to the law of statics, the tension T of this cable can be calculated

$$T = \frac{L_b L_c W}{D\sqrt{L_b^2 - D^2}}$$

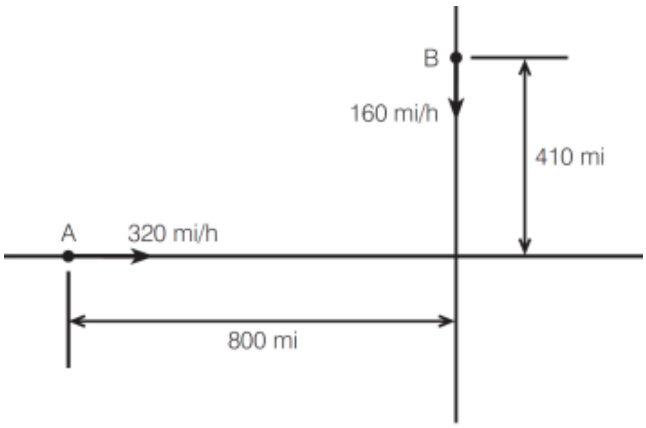
Where D is the distance from the connection cable to the beam column. Refer to the following figure



(a) Given that $W = 400$ N，$L_b = 3$ m, and $L_c = 5$ m，use pointwise operation and 'min' function to find the distance D which lead to the minimum tension T.

(b) Plot the relationship between the tension T and the distance D.

6. Aircraft **A** flew east at a rate of 320 mi/hr and aircraft **B** flew south at a rate of 160 mi/hr. The position of the aircraft at 1 pm is shown in the following Figure.



(a) Find the distance D between two airplanes as a function of time. D is plotted against time until D reaches its minimum value.

7. Given the following matrices

$$\mathbf{A} = \begin{bmatrix} 4 & -2 & 1 \\ 6 & 8 & -5 \\ 7 & 9 & 10 \end{bmatrix} \quad \mathbf{B} = \begin{bmatrix} 6 & 9 & -4 \\ 7 & 5 & 3 \\ -8 & 2 & 1 \end{bmatrix} \quad \mathbf{C} = \begin{bmatrix} -4 & -5 & 2 \\ 10 & 6 & 1 \\ 3 & -9 & 8 \end{bmatrix}$$

Use the MATLAB to verify the following properties:

(a) The association property:

$$A(B + C) = AB + AC$$

(b) The distribution property :

$$(AB)C = A(BC)$$

8.

EXERCISES

6.1 Set up any 3×3 matrix a. Write some command-line statements to perform the following operations on a:

(a) interchange columns 2 and 3;

(b) add a fourth column (of 0s);

(c) insert a row of 1s as the new second row of a (i.e. move the current second and third rows down);

(d) remove the second column.

9.

6.2 Compute the limiting probabilities for the student in Section 6.5 when he starts at each of the remaining intersections in turn, and confirm that the closer he starts to the cafe, the more likely he is to end up there.
Compute `P^50` directly. Can you see the limiting probabilities in the first row?

10.

6.6 If you are familiar with *Gauss reduction* it is an excellent programming exercise to code a Gauss reduction directly with operations on the rows of the augmented coefficient matrix. See if you can write a function

```
x = mygauss(a, b)
```

to solve the general system $\mathbf{Ax} = \mathbf{b}$. Skillful use of the colon operator in the row operations can reduce the code to a few lines!
Test it on $\mathbf{A}$ and $\mathbf{b}$ with random entries, and on the systems in Section 6.6 and Exercise 16.4. Check your solutions with left division.