```
A: matrix([1, 2, 3], [4, 5, 6], [7, 8, 9]);
```

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

```
A[1, 2];  /* Accesses the element in the first row and second column (2) */
```

$$2$$

```
B: matrix([9, 8, 7], [6, 5, 4], [3, 2, 1]);
C: A + B;
D: A - B;
```

$$\begin{pmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{pmatrix} \qquad \begin{pmatrix} 10 & 10 & 10 \\ 10 & 10 & 10 \\ 10 & 10 & 10 \end{pmatrix} \qquad \begin{pmatrix} -8 & -6 & -4 \\ -2 & 0 & 2 \\ 4 & 6 & 8 \end{pmatrix}$$

```
E: A . B;
```

$$\begin{pmatrix} 30 & 24 & 18 \\ 84 & 69 & 54 \\ 138 & 114 & 90 \end{pmatrix}$$

```
F: 2 · A;  /* Multiplies every element of A by 2 */
```

$$\begin{pmatrix} 2 & 4 & 6 \\ 8 & 10 & 12 \\ 14 & 16 & 18 \end{pmatrix}$$

```
G: transpose(A);
```

$$\begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{pmatrix}$$

```
;
I: ident(3);  /* Creates a 3x3 identity matrix */
```

$$\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

```
matrix_size(A);  /* Returns [3, 3] for a 3x3 matrix */
```

$$[3,3]$$

```
row1: row(A, 1);  /* Extracts the first row [1, 2, 3] */
```

$$\begin{pmatrix} 1 & 2 & 3 \end{pmatrix}$$

```
col1: col(A, 1);  /* Extracts the first column [1, 4, 7] */
```

$$\begin{pmatrix} 1 \\ 4 \\ 7 \end{pmatrix}$$

```
aug_AB: augment(A, B);
```

$$\text{augment}\left(\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}, \begin{pmatrix} 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{pmatrix}\right)$$

```
app_AB: append(A, B);
```

$$\begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \\ 9 & 8 & 7 \\ 6 & 5 & 4 \\ 3 & 2 & 1 \end{pmatrix}$$

```
zero_mat: zeromatrix(3, 3);  /* Creates a 3x3 zero matrix */
```

$$\begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$$

```
A_squared: A^^2;  /* Computes A * A */
A_cubed: A^^3;    /* Computes A * A * A */
```

$$\begin{pmatrix} 30 & 36 & 42 \\ 66 & 81 & 96 \\ 102 & 126 & 150 \end{pmatrix} \qquad \begin{pmatrix} 468 & 576 & 684 \\ 1062 & 1305 & 1548 \\ 1656 & 2034 & 2412 \end{pmatrix}$$

```
/* Define the coefficient matrix and right-hand side vector */
M: matrix([2, 1, −1], [−3, −1, 2], [−2, 1, 2]);
B: matrix([8], [−11], [−3]);

/* Solve the linear system */
linsolve([2·x + y − z = 8, −3·x − y + 2·z = −11, −2·x + y + 2·z = −3], [x, y, z]);
```

$$\begin{pmatrix} 2 & 1 & -1 \\ -3 & -1 & 2 \\ -2 & 1 & 2 \end{pmatrix} \qquad \begin{pmatrix} 8 \\ -11 \\ -3 \end{pmatrix} \qquad [x = 2, y = 3, z = -1]$$

```
/* Define the augmented matrix */
A: matrix([2, 1, −1, 8], [−3, −1, 2, −11], [−2, 1, 2, −3]);

/* Perform elimination */
A_echelon: echelon(A);

/* Display the matrix in reduced row-echelon form */
A_echelon;
```

$$\begin{pmatrix} 2 & 1 & -1 & 8 \\ -3 & -1 & 2 & -11 \\ -2 & 1 & 2 & -3 \end{pmatrix} \qquad \begin{pmatrix} 1 & \frac{1}{2} & -\left(\frac{1}{2}\right) & 4 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & -1 \end{pmatrix}$$

$$\begin{pmatrix} 1 & \frac{1}{2} & -\left(\frac{1}{2}\right) & 4 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & -1 \end{pmatrix}$$

```
triangularize(A);
```

$$\begin{pmatrix} 2 & 1 & -1 & 8 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & -1 & 1 \end{pmatrix}$$

```
B2: matrix([1,1,1],[1,1,1],[1,1,1])
;
```

$$\begin{pmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{pmatrix}$$

```
rank(B2);
```

$$1$$