

(* Matrix Manipulation *)

```
In[1]:= (* defining zero-matrix with n=4 rows and m=6 columns *)  
a = Table[0, {4}, {6}];  
MatrixForm[a]
```

Out[2]//MatrixForm=

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

```
In[3]:= (* substituting sth for a matrix element *)  
a[[2, 3]] = 15;  
MatrixForm[a]
```

Out[4]//MatrixForm=

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 15 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

In[5]:=

```
(* part of the matrix 'a' a[[number_of_beginning_row;;number_of_ending_row,  
number_of_beginning_column;;number_of_ending_column]]*)  
a = Table[10 i + j, {i, 7}, {j, 7}];  
MatrixForm[a]  
b = a[[2 ;; 4, 5 ;; 7]];  
MatrixForm[b]
```

Out[6]//MatrixForm=

$$\begin{pmatrix} 11 & 12 & 13 & 14 & 15 & 16 & 17 \\ 21 & 22 & 23 & 24 & 25 & 26 & 27 \\ 31 & 32 & 33 & 34 & 35 & 36 & 37 \\ 41 & 42 & 43 & 44 & 45 & 46 & 47 \\ 51 & 52 & 53 & 54 & 55 & 56 & 57 \\ 61 & 62 & 63 & 64 & 65 & 66 & 67 \\ 71 & 72 & 73 & 74 & 75 & 76 & 77 \end{pmatrix}$$

Out[8]//MatrixForm=

$$\begin{pmatrix} 25 & 26 & 27 \\ 35 & 36 & 37 \\ 45 & 46 & 47 \end{pmatrix}$$

```
(* transposition of the matrix -- command Transpose *)  
Transpose[b];  
MatrixForm[%]
```

```
(* determinant of the matrix 'a' ---- Det[a] *)
(* inversion of the matrix -- command Inverse *)
b = b + IdentityMatrix[3];
Det[b]
Inverse[b];
MatrixForm[%]
```

Out[13]= 49

Out[15]//MatrixForm=

$$\begin{pmatrix} \frac{74}{49} & -\frac{6}{49} & -\frac{37}{49} \\ -\frac{15}{49} & \frac{33}{49} & -\frac{17}{49} \\ -\frac{55}{49} & -\frac{26}{49} & \frac{52}{49} \end{pmatrix}$$

```
(* joining matrices - command Join *)
```

```
a = Table[10 i + j, {i, 7}, {j, 7}];
MatrixForm[a]
b1 = a[[1 ;; 3, 5 ;; 7]];
MatrixForm[b1]
b2 = a[[3 ;; 5, 2 ;; 4]];
MatrixForm[b2]
(* join b1 and b2 creating longer columns - number of columns remains the same *)
c1 = Join[b1, b2];
MatrixForm[c1]
(* join b1 and b2 creating longer rows - number of rows remain the same *)
c1 = Join[b1, b2, 2];
MatrixForm[c1]
```

Out[17]//MatrixForm=

$$\begin{pmatrix} 11 & 12 & 13 & 14 & 15 & 16 & 17 \\ 21 & 22 & 23 & 24 & 25 & 26 & 27 \\ 31 & 32 & 33 & 34 & 35 & 36 & 37 \\ 41 & 42 & 43 & 44 & 45 & 46 & 47 \\ 51 & 52 & 53 & 54 & 55 & 56 & 57 \\ 61 & 62 & 63 & 64 & 65 & 66 & 67 \\ 71 & 72 & 73 & 74 & 75 & 76 & 77 \end{pmatrix}$$

Out[19]//MatrixForm=

$$\begin{pmatrix} 15 & 16 & 17 \\ 25 & 26 & 27 \\ 35 & 36 & 37 \end{pmatrix}$$

Out[21]//MatrixForm=

$$\begin{pmatrix} 32 & 33 & 34 \\ 42 & 43 & 44 \\ 52 & 53 & 54 \end{pmatrix}$$

Out[23]//MatrixForm=

$$\begin{pmatrix} 15 & 16 & 17 \\ 25 & 26 & 27 \\ 35 & 36 & 37 \\ 32 & 33 & 34 \\ 42 & 43 & 44 \\ 52 & 53 & 54 \end{pmatrix}$$

Out[25]//MatrixForm=

$$\begin{pmatrix} 15 & 16 & 17 & 32 & 33 & 34 \\ 25 & 26 & 27 & 42 & 43 & 44 \\ 35 & 36 & 37 & 52 & 53 & 54 \end{pmatrix}$$

```

(* Calculating adjoint matrix →
   see help for command Minors chapter application → function 'adj'*)
adj[m_] := Map[Reverse, Minors[Transpose[m], Length[m] - 1], {0, 1}]
   Table[(-1)^(i + j), {i, Length[m]}, {j, Length[m]}]
adj[b1]
{{-10, 20, -10}, {20, -40, 20}, {-10, 20, -10}}

```