# Elementary Matrices Using *Mathematica*

In[1]:=
```
A = {{1, 2, 3}, {4, 5, 6}, {7, 8, 0}}
```

Out[1]=
```
{{1, 2, 3}, {4, 5, 6}, {7, 8, 0}}
```

In[2]:=
```
A // MatrixForm
```

Out[2]//MatrixForm=

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

In[3]:=
```
MatrixForm[A]
```

Out[3]//MatrixForm=

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

In[4]:=
```
E21 = {{1, 0, 0}, {-4, 1, 0}, {0, 0, 1}};
E21 // MatrixForm
```

Out[5]//MatrixForm=

$$\begin{pmatrix} 1 & 0 & 0 \\ -4 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

In[6]:=
```
E21.A
```

Out[6]=
```
{{1, 2, 3}, {0, -3, -6}, {7, 8, 0}}
```

In[7]:=
```
MatrixForm[E21.A]
```

Out[7]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 7 & 8 & 0 \end{pmatrix}$$

In[8]:=
```
E31 = {{1, 0, 0}, {0, 1, 0}, {-7, 0, 1}};

E31.E21.A // MatrixForm
```

Out[9]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & -6 & -21 \end{pmatrix}$$

In[10]:=
```
E32 = {{1, 0, 0}, {0, 1, 0}, {0, -2, 1}};

E32.E31.E21.A // MatrixForm
```

Out[11]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & -9 \end{pmatrix}$$

In[12]:=
```
F = E32.E31.E21;

F // MatrixForm

F.A // MatrixForm
```

Out[13]//MatrixForm=

$$\begin{pmatrix} 1 & 0 & 0 \\ -4 & 1 & 0 \\ 1 & -2 & 1 \end{pmatrix}$$

Out[14]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & -3 & -6 \\ 0 & 0 & -9 \end{pmatrix}$$

In[15]:=
```
Ab = {{1, 2, 3, b1}, {4, 5, 6, b2}, {7, 8, 0, b3}};

Ab // MatrixForm

F.Ab // MatrixForm
```

Out[16]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & b1 \\ 4 & 5 & 6 & b2 \\ 7 & 8 & 0 & b3 \end{pmatrix}$$

Out[17]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & b1 \\ 0 & -3 & -6 & -4\,b1 + b2 \\ 0 & 0 & -9 & b1 - 2\,b2 + b3 \end{pmatrix}$$

In[18]:=
```
{b1, b2, b3} = {4, 3, 5};

MatrixForm[Ab]

MatrixForm[F.Ab]
```

Out[19]//MatrixForm=

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

Out[20]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & 4 \\ 0 & -3 & -6 & -13 \\ 0 & 0 & -9 & 3 \end{pmatrix}$$