In[1]:=
```
Clear[A]
A = {{1, 2, 3}, {2, 6, 10}, {3, 14, 28}};
A // MatrixForm
```

Out[3]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 6 & 10 \\ 3 & 14 & 28 \end{pmatrix}$$

In[4]:=
```
x = {x1, x2, x3};
MatrixForm[x]
```

Out[5]//MatrixForm=

$$\begin{pmatrix} x1 \\ x2 \\ x3 \end{pmatrix}$$

In[6]:=
```
b = {{1}, {0}, {-8}};
b // MatrixForm
```

Out[7]//MatrixForm=

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

In[8]:=
```
aug = ArrayFlatten[{{A, b}}];
aug // MatrixForm
```

Out[9]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & 1 \\ 2 & 6 & 10 & 0 \\ 3 & 14 & 28 & -8 \end{pmatrix}$$

In[10]:=
```
aug[[2]] = aug[[2]] - 2 aug[[1]];
aug[[3]] = aug[[3]] - 3 aug[[1]];
aug // MatrixForm
```

Out[12]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 & 1 \\ 0 & 2 & 4 & -2 \\ 0 & 8 & 19 & -11 \end{pmatrix}$$

In[13]:=
```
aug[[3]] = aug[[3]] - 4 aug[[2]];
aug // MatrixForm
```

Out[14]//MatrixForm=

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

In[15]:=
```
upper = Take[aug, 3, 3];
upper // MatrixForm
```

Out[16]//MatrixForm=

$$\begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & 4 \\ 0 & 0 & 3 \end{pmatrix}$$

In[17]:=
```
c = Take[aug, 3, -1];
c // MatrixForm
```

Out[18]//MatrixForm=

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

In[19]:=
```
upper.x == c
```

Out[19]= {x1 + 2 x2 + 3 x3, 2 x2 + 4 x3, 3 x3} == {{1}, {-2}, {-3}}

In[20]:=
```
Solve[upper.x == c]
```

Out[20]= {{x1 → 2, x2 → 1, x3 → -1}}

In[21]:=
```
Ques2.
Clear[A]
A = {{2, 3, 1}, {1, 2, 2}, {1, 3, 1}};
A // MatrixForm
```

Out[21]= Ques2.Null

Out[23]//MatrixForm=

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

In[24]:=
```
x = {x1, x2, x3};
MatrixForm[x]
```

Out[25]//MatrixForm=

$$\begin{pmatrix} x1 \\ x2 \\ x3 \end{pmatrix}$$

In[26]:=
```
b = {{1}, {4}, {3}};
b // MatrixForm
```

Out[27]//MatrixForm=

$$\begin{pmatrix} 1 \\ 4 \\ 3 \end{pmatrix}$$

In[28]:=
```
aug = ArrayFlatten[{{A, b}}];
aug // MatrixForm
```

Out[29]//MatrixForm=

$$\begin{pmatrix} 2 & 3 & 1 & 1 \\ 1 & 2 & 2 & 4 \\ 1 & 3 & 1 & 3 \end{pmatrix}$$

In[30]:=
```
aug[[2]] = 2 aug[[2]] - aug[[1]];
aug[[3]] = 2 aug[[3]] - aug[[1]];
aug // MatrixForm
```

Out[32]//MatrixForm=

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

In[33]:=
```
aug[[3]] = aug[[3]] - 3 aug[[2]];
aug // MatrixForm
```

Out[34]//MatrixForm=

$$\begin{pmatrix} 2 & 3 & 1 & 1 \\ 0 & 1 & 3 & 7 \\ 0 & 0 & -8 & -16 \end{pmatrix}$$

In[35]:=
```
upper = Take[aug, 3, 3];
upper // MatrixForm
```

Out[36]//MatrixForm=

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

In[37]:=
```
c = Take[aug, 3, -1];
c // MatrixForm
```

Out[38]//MatrixForm=

$$\begin{pmatrix} 1 \\ 7 \\ -16 \end{pmatrix}$$

In[39]:=
```
upper.x == c
```

Out[39]= {2 x1 + 3 x2 + x3, x2 + 3 x3, −8 x3} == {{1}, {7}, {−16}}

In[40]:=
```
Solve[upper.x == c]
```

Out[40]= {{x1 → −2, x2 → 1, x3 → 2}}

In[41]:=
```
Ques3.
Clear[A]
A = {{1, 1, -1}, {0, 1, 3}, {-1, 0, 2}};
A // MatrixForm
```

Out[41]= Ques3.Null

Out[43]//MatrixForm=

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

In[44]:=
```
x = {x1, x2, x3};
MatrixForm[x]
```

Out[45]//MatrixForm=

$$\begin{pmatrix} x1 \\ x2 \\ x3 \end{pmatrix}$$

In[48]:=
```
b = {{9}, {3}, {2}};
b // MatrixForm
```

Out[49]//MatrixForm=

$$\begin{pmatrix} 9 \\ 3 \\ 2 \end{pmatrix}$$

In[50]:=
```
aug = ArrayFlatten[{{A, b}}];
aug // MatrixForm
```

Out[51]//MatrixForm=

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

In[52]:=
```
aug[[3]] = aug[[3]] + aug[[1]];
aug[[3]] = aug[[3]] - aug[[2]];
aug // MatrixForm
```

Out[54]//MatrixForm=

$$\begin{pmatrix} 1 & 1 & -1 & 9 \\ 0 & 1 & 3 & 3 \\ 0 & 0 & -2 & 8 \end{pmatrix}$$

In[55]:=
```
upper = Take[aug, 3, 3];
upper // MatrixForm
```

Out[56]//MatrixForm=

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

In[57]:=
```
c = Take[aug, 3, -1];
c // MatrixForm
```

Out[58]//MatrixForm=

$$\begin{pmatrix} 9 \\ 3 \\ 8 \end{pmatrix}$$

In[59]:=
```
upper.x == c
```

Out[59]=
```
{x1 + x2 - x3, x2 + 3 x3, -2 x3} == {{9}, {3}, {8}}
```

In[60]:=
```
Solve[upper.x == c]
```

Out[60]=
```
{{x1 → -10, x2 → 15, x3 → -4}}
```

In[61]:=
```
Ques 4.
Clear[A];
A = {{1, 4, 1}, {2, 2, 1}, {3, 6, 1}};
A
x = {x1, x2, x3}
b = {{1}, {2}, {3}};
b
aug = ArrayFlatten[{{A, b}}];
aug
aug[[3]] = aug[[3]] - 3 aug[[1]];
aug[[2]] = aug[[2]] - 2 aug[[1]];
aug[[3]] = aug[[2]] - aug[[3]];
aug
upper = Take[aug, 3, 3];
upper
c = Take[aug, 3, -1];
c
upper.x == c
Solve[upper.x == c]
```

Out[61]= 4. Ques

Out[64]= {{1, 4, 1}, {2, 2, 1}, {3, 6, 1}}

Out[65]= {x1, x2, x3}

Out[67]= {{1}, {2}, {3}}

Out[69]= {{1, 4, 1, 1}, {2, 2, 1, 2}, {3, 6, 1, 3}}

Out[73]= {{1, 4, 1, 1}, {0, −6, −1, 0}, {0, 0, 1, 0}}

Out[75]= {{1, 4, 1}, {0, −6, −1}, {0, 0, 1}}

Out[77]= {{1}, {0}, {0}}

Out[78]= {x1 + 4 x2 + x3, −6 x2 − x3, x3} == {{1}, {0}, {0}}

Out[79]= {{x1 → 1, x2 → 0, x3 → 0}}