```
(* ESERCIZIO 6.1.3 (a) *)

Clear[a, b, x];
a = {{1, -2, 3}, {3, -3, 1}, {1, 1, 0}};
b = {2, -1, 3};
x = {x1, x2, x3};
MatrixForm[a]
sys = Dot[a, x] == b;
MatrixForm[Thread[sys]]

ab = {Join[a[[1]], {b[[1]]}], Join[a[[2]], {b[[2]]}], Join[a[[3]], {b[[3]]}]};
MatrixForm[ab]

ab1 = {ab[[1]], 3 * ab[[1]] - ab[[2]], ab[[1]] - ab[[3]]};
MatrixForm[ab1]
ab2 = {ab1[[1]], ab1[[2]], ab1[[2]] - ab1[[3]]};
MatrixForm[ab2]

x3sol = 8 / 5
x2sol = -(7 - 8 * x3sol) / 3
x1sol = 2 - 3 * x3sol + 2 * x2sol

Solve[sys, x]

(* ESERCIZIO 6.1.3 (c) *)

Clear[a, b, x];
a = {{2., 0., 0., 0.}, {1., 1.5, 0., 0.}, {0., -3., 0.5, 0.}, {2., -2., 1., 1.}};
b = {3., 4.5, -6.6, -8.};
x = {x1, x2, x3, x4};
MatrixForm[a]
sys = Dot[a, x] == b;
MatrixForm[Thread[sys]]

ab = {Join[a[[1]], {b[[1]]}], Join[a[[2]], {b[[2]]}],
   Join[a[[3]], {b[[3]]}], Join[a[[4]], {b[[4]]}]};
MatrixForm[
 ab]

ab1 = {ab[[1]], ab[[2]] - 0.5 * ab[[1]], ab[[3]], ab[[4]] - ab[[1]]};
MatrixForm[ab1]

ab2 = {ab1[[1]], ab1[[2]], ab1[[3]] + 2. * ab1[[2]], ab1[[4]] + (2. / 1.5) * ab1[[2]]};
MatrixForm[ab2]

ab3 = {ab2[[1]], ab2[[2]], ab2[[3]], ab2[[4]] - 2. * ab2[[3]]};
MatrixForm[ab3]

x4sol = -5.8
x3sol = -1.2
x2sol = 2.
x1sol = 1.5

Solve[sys, x]

(* ESERCIZIO 6.1.5 *)

Clear[a, b, x];
a = {{2, -6 α}, {3 α, -1}};
b = {3, 3 / 2};
x = {x1, x2};
MatrixForm[a]
sys = Dot[a, x] == b;
MatrixForm[Thread[sys]]
```

$$\begin{pmatrix} 2 & -6\,\alpha \\ 3\,\alpha & -1 \end{pmatrix}$$

$$\begin{pmatrix} 2\,x1 - 6\,x2\,\alpha == 3 \\ -x2 + 3\,x1\,\alpha == \frac{3}{2} \end{pmatrix}$$

```
ab = {Join[a[[1]], {b[[1]]}], Join[a[[2]], {b[[2]]}]]};
MatrixForm[ab]
```

$$\begin{pmatrix} 2 & -6\,\alpha & 3 \\ 3\,\alpha & -1 & \frac{3}{2} \end{pmatrix}$$

```
ab1 = {ab[[1]], ab[[2]] - (3 / 2) * α * ab[[1]]};
MatrixForm[ab1]
```

$$\begin{pmatrix} 2 & -6\,\alpha & 3 \\ 0 & -1 + 9\,\alpha^2 & \frac{3}{2} - \frac{9\,\alpha}{2} \end{pmatrix}$$

```
(* (a) *) eq1 = -1 + 9 α^2 == 0;
sol1 = Solve[eq1, α]
```

$$-1 + 9\,\alpha^2 == 0$$

$$\left\{ \left\{ \alpha \to -\frac{1}{3} \right\}, \left\{ \alpha \to \frac{1}{3} \right\} \right\}$$

```
(* (b) *) eq2 = 3/2 - 9 α/2 == 0
sol2 = Solve[eq2, α]
```

$$\frac{3}{2} - \frac{9\,\alpha}{2} == 0$$

$$\left\{ \left\{ \alpha \to \frac{1}{3} \right\} \right\}$$

```
(* Proposta: ESERCIZIO 6.2.11,12,13 *)
(* Proposta: ESERCIZIO 6.2.16 *)

(* Proposta: ESERCIZIO 6.3.1 *)
```

```
Clear[a, b, c, d, e, f]
a = {{4, 2, 6}, {3, 0, 7}, {-2, -1, -3}};
b = {{1, 2, 0}, {2, 1, -1}, {3, 1, 1}};
c = {{4, 0, 0}, {0, 0, 0}, {0, 0, 3}};
d = {{1, 1, -1, 1}, {1, 2, -4, -2}, {2, 1, 1, 5}, {2, 1, 1, 5}};
e = {{4, 0, 0, 0}, {6, 7, 0, 0}, {9, 11, 1, 0}, {5, 4, 1, 1}};
f = {{2, 0, 1, 2}, {1, 1, 0, 2}, {2, -1, 3, 1}, {3, -1, 4, 3}};
MatrixForm[a]
MatrixForm[b]
MatrixForm[c]
MatrixForm[d]
MatrixForm[e]
MatrixForm[f]
n1 = 3; n2 = 4;
```

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

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

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

$$\begin{pmatrix} 1 & 1 & -1 & 1 \\ 1 & 2 & -4 & -2 \\ 2 & 1 & 1 & 5 \\ 2 & 1 & 1 & 5 \end{pmatrix}$$

$$\begin{pmatrix} 4 & 0 & 0 & 0 \\ 6 & 7 & 0 & 0 \\ 9 & 11 & 1 & 0 \\ 5 & 4 & 1 & 1 \end{pmatrix}$$

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

```
n = n1;
t = c;
Do[r[i] = t[[i]][[1]] / t[[1]][[1]], {i, 2, n}]
t1 = {t[[1]], t[[2]] - t[[1]] r[2], t[[3]] - t[[1]] * r[3]};
MatrixForm[t1]

Do[r[i] = t1[[i]][[2]] / t1[[2]][[2]], {i, 3, n}]
t2 = {t1[[1]], t1[[2]], t1[[3]] - t1[[2]] * r[3]};
MatrixForm[t2]

n = n2;
t = f;
Do[r[i] = t[[i]][[1]] / t[[1]][[1]], {i, 2, n}]
t1 = {t[[1]], t[[2]] - t[[1]] r[2], t[[3]] - t[[1]] * r[3], t[[4]] - t[[1]] * r[4]};
MatrixForm[t1]
```

$$\begin{pmatrix} 2 & 0 & 1 & 2 \\ 0 & 1 & -\frac{1}{2} & 1 \\ 0 & -1 & 2 & -1 \\ 0 & -1 & \frac{5}{2} & 0 \end{pmatrix}$$

```
Do[r[i] = t1[[i]][[2]] / t1[[2]][[2]], {i, 3, n}]
t2 = {t1[[1]], t1[[2]], t1[[3]] - t1[[2]] * r[3], t1[[4]] - t1[[2]] * r[4]};
MatrixForm[t2]
```

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

```
Do[r[i] = t2[[i]][[3]] / t2[[3]][[3]], {i, 4, n}]
t3 = {t2[[1]], t2[[2]], t2[[3]], t2[[4]] - t2[[3]] * r[4]};
MatrixForm[t3]
```

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

```
(* ESERCIZIO 6.3.12 *)

(* Proposta: ESERCIZIO 6.3.14 *)
```