

In [1]:

```
var('p,t')
A=matrix(4,4,[1,1,-2,3,2,1,-6,4,3,2,p,7,1,-1,-6,-1])
b=vector([0,-1,-1,t]).column()
show(A.augment(b))
```

Out[1]:

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

In [2]:

```
#R2:=R2-2*R1
#R3:=R3-3*R1
#R4:=R4-R1
B=matrix(4,4,[1,0,0,0,-2,1,0,0,-3,0,1,0,-1,0,0,1])
show(B*A.augment(b))
```

Out[2]:

$$\begin{pmatrix} 1 & 1 & -2 & 3 & 0 \\ 0 & -1 & -2 & -2 & -1 \\ 0 & -1 & p+6 & -2 & -1 \\ 0 & -2 & -4 & -4 & t \end{pmatrix}$$

In [3]:

```
#R2:=-R2
C=matrix(4,4,[1,0,0,0,0,-1,0,0,0,0,1,0,0,0,0,1])
show(C*B*A.augment(b))
```

Out[3]:

$$\begin{pmatrix} 1 & 1 & -2 & 3 & 0 \\ 0 & 1 & 2 & 2 & 1 \\ 0 & -1 & p+6 & -2 & -1 \\ 0 & -2 & -4 & -4 & t \end{pmatrix}$$

In [4]:

```
#R3:=R2+R3
#R4:=2R2+R4
D=matrix(4,4,[1,0,0,0,0,1,0,0,0,1,1,0,0,2,0,1])
show(D*C*B*A.augment(b))
```

Out[4]:

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

In [5]:

```
#Therefore, inconsistent when t not equals -2  
# consistent when t=-2  
# Suppose t=-2, and suppose p=-8, a plane solution  
# Suppose t=-2, and suppose p not equals -8, a line solution
```

In [0]: