

In [1]:

```
# Q2
var('a,b,c')
v_1=vector([1,a,b*c])
v_2=vector([1,b,c*a])
v_3=vector([1,c,a*b])
show(matrix([v_1,v_2,v_3]).det())
```

Out[1]:

$$-a^2 b + ab^2 + a^2 c - b^2 c - ac^2 + bc^2$$

In [2]:

```
# Q4
var('u')
A=matrix([[1-u,0,-1],[1,2-u,1],[2,2,3-u]])
show(A)
```

Out[2]:

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

In [3]:

```
show(A.det())
```

Out[3]:

$$-((u-2)(u-3)-2)(u-1)-2u+2$$

In [4]:

```
f(u)=A.det().poly(u).factor()
show(f)
```

Out[4]:

$$u \mapsto -(u-1)(u-2)(u-3)$$