```
> restart: with(linalg):
Warning, the protected names norm and trace have been
redefined and unprotected
```

```
> a11:=1; a12:=2;
  a21:=5; a22:=8;
```

$$a11 := 1$$

$$a12 := 2$$

$$a21 := 5$$

$$a22 := 8$$

```
> A:=matrix(2,2,[a11,a12,a21,a22]);
```

$$A := \begin{bmatrix} 1 & 2 \\ 5 & 8 \end{bmatrix}$$

```
> det(A-lambda*diag(1,1));
```

$$-2 - 9\,\lambda + \lambda^2$$

```
> factor(det(A-lambda*diag(1,1)));
```

$$-2 - 9\,\lambda + \lambda^2$$

```
> solve(det(A-lambda*diag(1,1)));
```

$$\frac{9}{2} + \frac{\sqrt{89}}{2}, \frac{9}{2} - \frac{\sqrt{89}}{2}$$

Hallar la expresión de la aplicación lineal *f* que verifica:
los vectores u_1, u_2 son autovectores de *f* asociados al autovalor 1,
los vectores u_3, u_4 son autovectores de *f* asociados al autovalor 3
y u_5 es un autovector de *f* asociado al autovalor -1.

```
> u1:=[1,2,0,0,0];
  u2:=[0,1,1,0,0];
```

```
u3:=[0,1,2,3,4];
u4:=[0,3,0,0,1];
u5:=[0,3,4,0,1];
```

$$u1 := [1, 2, 0, 0, 0]$$

$$u2 := [0, 1, 1, 0, 0]$$

$$u3 := [0, 1, 2, 3, 4]$$

$$u4 := [0, 3, 0, 0, 1]$$

$$u5 := [0, 3, 4, 0, 1]$$

La matriz de cambio de base es:

```
> P:=concat(u1,u2,u3,u4,u5):
> det(P):
```

La matriz de f en la base de partida es:

```
> M:=evalm(P&*diag(1,1,3,3,-1)&*inverse(P));
```

$$M := \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ -6 & 4 & -3 & \frac{17}{3} & -3 \\ -4 & 2 & -1 & 10 & -6 \\ 0 & 0 & 0 & 3 & 0 \\ -2 & 1 & -1 & \frac{13}{3} & 0 \end{bmatrix}$$

```
> f:=(x1,x2,x3,x4,x5)->evalm(M&*[x1,x2,x3,x4
  ,x5]);
```

$f :=$

$$(x1, x2, x3, x4, x5) \rightarrow \text{evalm}(\text{`&*`}(M, [x1, x2, x3, x4, x5]))$$

Comprobación:

```
> f(1,2,0,0,0);
```

$$[1, 2, 0, 0, 0]$$

```
> f(0,1,1,0,0);
```

```
                                [0, 1, 1, 0, 0]
> f(0,1,2,3,4);
                                [0, 3, 6, 9, 12]
> f(0,3,0,0,1);
                                [0, 9, 0, 0, 3]
> f(0,3,4,0,1);
                                [0, -3, -4, 0, -1]
>
```