13-Change-of-Basis

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In [1]:
```
from latools import *
from sympy import *
init_printing(use_latex=True)
```

In [2]:
```
v1 = Matrix([2,-1,1])
v2 = Matrix([1,0,-3])
v3 = Matrix([0,4,0])
```

In [3]:
```
P = Matrix.hstack(v1,v2,v3)
P
```

Out[3]:

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

In [4]:
```
u = Matrix([3,4,0])
u
```

Out[4]:

$$\begin{bmatrix} 3 \\ 4 \\ 0 \end{bmatrix}$$

In [5]:
```
P*u
```

Out[5]:

$$\begin{bmatrix} 10 \\ -3 \\ -9 \end{bmatrix}$$

In [6]:
```
w = Matrix([1,2,-1])
w
```

Out[6]:

$$\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

In [7]:
```
P**(-1)
```

Out[7]:

$$\begin{bmatrix} \frac{3}{7} & 0 & \frac{1}{7} \\ \frac{1}{7} & 0 & -\frac{2}{7} \\ \frac{3}{28} & \frac{1}{4} & \frac{1}{28} \end{bmatrix}$$

In [8]:
```
P**(-1) * w
```

Out[8]:

$$\begin{bmatrix} \frac{2}{7} \\ \frac{3}{7} \\ \frac{4}{7} \end{bmatrix}$$

In [9]:
```
Rational(2,7)*v1+Rational(3,7)*v2+Rational(4,7)*v3
```

Out[9]:

$$\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

In [10]:
```
A = Matrix([[1, 1, 0],[0, -2, 2], [0, 0, 1]])
A
```

Out[10]:

$$\begin{bmatrix} 1 & 1 & 0 \\ 0 & -2 & 2 \\ 0 & 0 & 1 \end{bmatrix}$$

In [11]:
```
P*A*P**(-1)
```

Out[11]:

$$\begin{bmatrix} \frac{15}{14} & \frac{1}{2} & \frac{5}{14} \\ -\frac{1}{7} & 1 & \frac{2}{7} \\ \frac{11}{14} & -\frac{3}{2} & -\frac{29}{14} \end{bmatrix}$$

In [12]:
```
M=matrix_to_rational([[15,7,5],[-2,14,4],[11,-21,-29]])
```

In [13]:
```
P**(-1)*M*P
```

Out[13]:

$$\begin{bmatrix} 14 & 14 & 0 \\ 0 & -28 & 28 \\ 0 & 0 & 14 \end{bmatrix}$$

In [ ]: