In [1]:
```
a1=vector([1,0,1])
show(a1)
```

Out[1]:

$$(1,\ 0,\ 1)$$

In [2]:
```
a2=vector([-1,0,1])
show(a2)
```

Out[2]:

$$(-1,\ 0,\ 1)$$

In [3]:
```
d1=vector([3,2,-1])
show(d1)
```

Out[3]:

$$(3,\ 2,\ -1)$$

In [4]:
```
d2=vector([-2,-1,1])
show(d2)
```

Out[4]:

$$(-2,\ -1,\ 1)$$

In [5]:
```
d3=d1.cross_product(d2)
show(d3)
```

Out[5]:

$$(1,\ -1,\ 1)$$

In [6]:
```
A=matrix(QQ,[d1,-d2,d3]).transpose()
show(A)
```

Out[6]:

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

In [7]:
```
b=a2-a1
show(b)
```

Out[7]:

$$(-2,\ 0,\ 0)$$

In [8]:
```
Ab=A.augment(b)
show(Ab)
```

Out[8]:

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

In [9]:
```
show(Ab.rref())
```

Out[9]:
$$\begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -\frac{2}{3} \\ 0 & 0 & 1 & -\frac{2}{3} \end{pmatrix}$$

In [10]:
```
t1=Ab.rref().column(-1)[0]
show(t1)
```

Out[10]:
$$0$$

In [11]:
```
t2=Ab.rref().column(-1)[1]
show(t2)
```

Out[11]:
$$-\frac{2}{3}$$

In [12]:
```
t3=Ab.rref().column(-1)[2]
show(t3)
```

Out[12]:
$$-\frac{2}{3}$$

In [13]:
```
show(a1+t1*d1)
```

Out[13]:
$$(1,\, 0,\, 1)$$

In [14]:
```
show(a2+t2*d2)
```

Out[14]:
$$\left(\frac{1}{3}, \frac{2}{3}, \frac{1}{3}\right)$$

In [17]:
```
dd=t3*d3
show(dd)
```

Out[17]:
$$\left(-\frac{2}{3}, \frac{2}{3}, -\frac{2}{3}\right)$$

In [18]:
```
show(dd.norm())
```

Out[18]:

$$2\sqrt{\frac{1}{3}}$$

In [0]: