

```
In [1]: x = matrix(QQ, [2, 3, 0, -1, 1/3])
x
```

```
Out[1]: [ 2  3  0 -1 1/3]
```

```
In [2]: x = x.transpose()
x
```

```
Out[2]: [ 2]
[ 3]
[ 0]
[-1]
[1/3]
```

```
In [3]: pretty_print(x)
```

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

```

```
In [4]: mu = 1
```

```
In [6]: I5 = identity_matrix(5)
e1 = I5[:,0]
e1
```

```
Out[6]: [1]
[0]
[0]
[0]
[0]
```

```
In [7]: I5
```

```
Out[7]: [1 0 0 0 0]
[0 1 0 0 0]
[0 0 1 0 0]
[0 0 0 1 0]
[0 0 0 0 1]
```

```
In [9]: norm_x = x.norm()
norm_x
```

```
Out[9]: 3.7564758898615485
```

```
In [11]: u = x-mu * norm_x*e1
u
```

```
Out[11]: [-1.7564758898615485]
[ 3.0]
[ 0.0]
[-1.0]
[ 0.3333333333333333]
```

```
In [26]: R = I5-2*(u*(u.transpose()))/((u.transpose()*u)[0,0])
```

```
In [27]: pretty_print(R)
```

Out[27]: 
$$\begin{pmatrix} 0.5324139056496682 & 0.7986208584745025 & 0.0 & -0.26620695282483414 & 0.08873565094161137 \\ 0.7986208584745025 & -0.3640167731606936 & 0.0 & 0.45467225772023123 & -0.15155741924007707 \\ 0.0 & 0.0 & 1.0 & 0.0 & 0.0 \\ -0.26620695282483414 & 0.45467225772023123 & 0.0 & 0.848442580759923 & 0.05051913974669235 \\ 0.08873565094161137 & -0.15155741924007707 & 0.0 & 0.05051913974669235 & 0.9831602867511026 \end{pmatrix}$$

In [28]: `u.transpose()*u`

Out[28]: `[13.19631866277603]`

In [29]: `pretty_print(x/norm(x))`

Out[29]: 
$$\begin{pmatrix} 0.5324139056496683 \\ 0.7986208584745025 \\ 0.0 \\ -0.26620695282483414 \\ 0.08873565094161137 \end{pmatrix}$$

In [30]: `latex(R)`

Out[30]: `\left(\begin{array}{rrrrr} 0.5324139056496682 & 0.7986208584745025 & 0.0 & -0.26620695282483414 & 0.08873565094161137 \\ 0.7986208584745025 & -0.3640167731606936 & 0.0 & 0.45467225772023123 & -0.15155741924007707 \\ 0.0 & 0.0 & 1.0 & 0.0 & 0.0 \\ -0.26620695282483414 & 0.45467225772023123 & 0.0 & 0.848442580759923 & 0.05051913974669235 \\ 0.08873565094161137 & -0.15155741924007707 & 0.0 & 0.05051913974669235 & 0.9831602867511026 \end{array}\right)`

In [0]: