

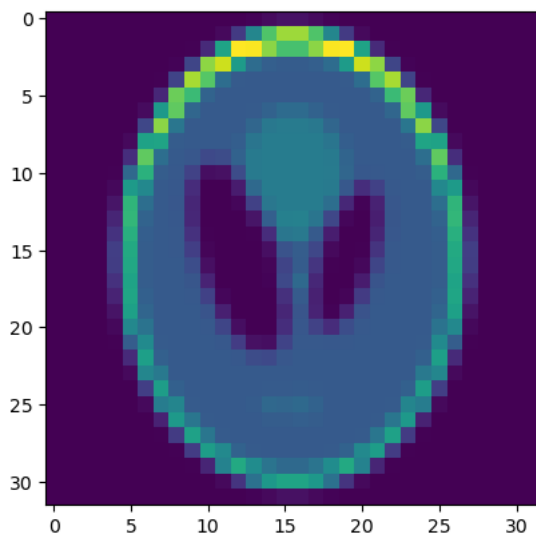
```
In [25]: import numpy as np
import matplotlib.pyplot as plt
from skimage.transform import radon, resize
from skimage.data import shepp_logan_phantom
import math
```

Problem 4.6.d

```
In [106]: def projmtx(N, theta):
    n_pixel = N*N
    projections = np.ceil(math.sqrt(2)*N)
    n_theta = len(theta)
    T = np.zeros((int(n_theta * projections), n_pixel))
    for i in range(n_pixel):
        unit_vector = np.zeros(n_pixel)
        unit_vector[i] = 1
        T[:,i] = radon(unit_vector.reshape((N,N)), theta = theta, circle=False).flatten()
    return T
```

```
In [107]: N = 32
X = resize(shepp_logan_phantom(), (N,N))
plt.imshow(X)
```

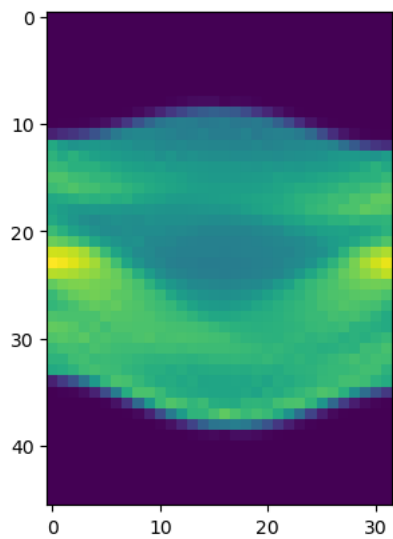
Out[107]: <matplotlib.image.AxesImage at 0x7faa99f715e0>



```
In [108]: theta = np.linspace(0., 180., N, endpoint=False)
T = projmtx(N, theta)
```

```
In [109]: y = T@X.flatten()  
y = y.reshape((46,32))  
plt.imshow(y)
```

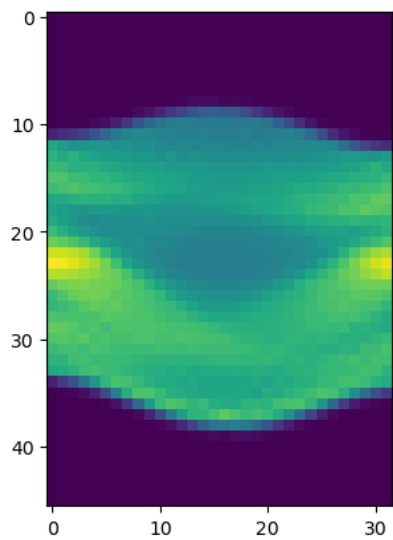
Out[109]: <matplotlib.image.AxesImage at 0x7faa88aba460>



```
In [110]: X_ = radon(X, theta, circle=False)
```

```
In [111]: plt.imshow(X_)
```

Out[111]: <matplotlib.image.AxesImage at 0x7faa78ff2fd0>



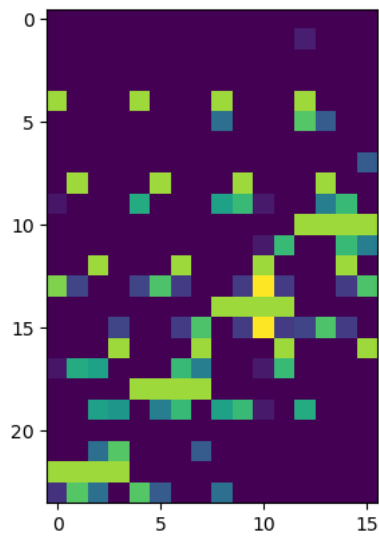
```
In [112]: 46*32
```

Out[112]: 1472

Problem 4.6.e

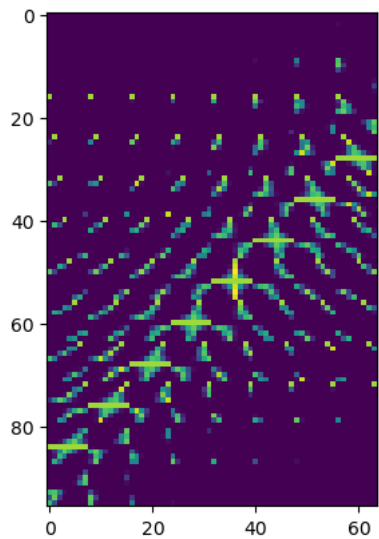
```
In [117]: N = 4  
theta = np.linspace(0., 180., N, endpoint=False)  
T = projmtx(N, theta)  
plt.imshow(T)
```

Out[117]: <matplotlib.image.AxesImage at 0x7faa7948fdf0>



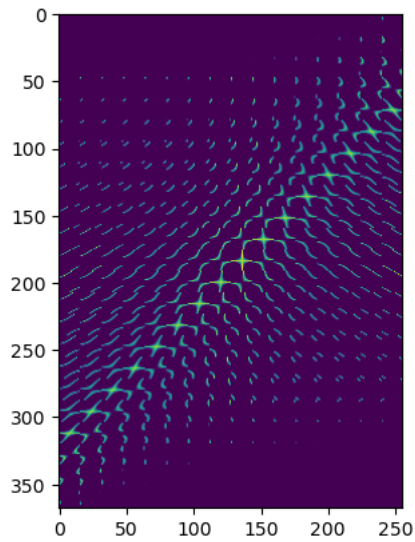
```
In [118]: N = 8  
theta = np.linspace(0., 180., N, endpoint=False)  
T = projmtx(N, theta)  
plt.imshow(T)
```

Out[118]: <matplotlib.image.AxesImage at 0x7faa79285c10>



```
In [119]: N = 16  
X = resize(shepp_logan_phantom(), (N,N))  
theta = np.linspace(0., 180., N, endpoint=False)  
T = projmtx(N, theta)  
plt.imshow(T)
```

Out[119]: <matplotlib.image.AxesImage at 0x7faa7966adc0>



In []:

In []: