Homework 2

Oscar Martinez

9/12/2019

```
#Problem 4
"-----Problem 4-----"
from numpy import *
set_printoptions(precision=2)

X = mat("6. 3. 9. 2.; 0. 4. 6. 1.; 0. 0. 8. 8.; 0. 0. 0. 5.")
y = mat(" 1.; 4.; 6.; 1.")
#print(X)
#print(y)
def backsub(X, y):
    l = shape(X)
    n = l[1]
    b = zeros((n,1))
    b[n-1, 0] = y[n-1, 0]/X[n-1, n-1]
    for j in range(n-1,0,-1):
        b[j-1,0] = (y[j-1,0] - dot(X[j-1, range(j,n)], b[range(j,n)\
   ,0]))/X[j-1, j-1]
    return b
print("b=")
print(backsub(X,y))
```

```
'-----Problem 4-----'
b=
[[-0.79]
 [ 0.12]
 [ 0.55]
 [ 0.2 ]]
```

```
#Problem 5
print("-----Problem 5-----")
x = mat(" 1.4; 5.8; 2.3; 8.1; 9.0")
#print(x)
#size(x)
def house(x):
    m = size(x)
    mu = linalg.norm(x)
```

```
    v = x.copy()
    if mu != 0:
        c = x[0] + sign(x[0])*mu
        v[1:m+1] = v[1:m+1]/c
    v[0] = 1
    return v
print("v=")
print(house(x))
```

-----Problem 5-----
v=
[[1.]
 [0.38]
 [0.15]
 [0.54]
 [0.6]]

```
#Problem 6
"-----Problem 6-----"
x = mat(" 1.4; 5.8; 2.3; 8.1; 9.0")
v=house(x)
X=mat("1.4 4.5 6.5; 5.8 3.2 7.3; 2.3 -2.6 8.2; 8.1 -5.8 -8.0; 9.0 \
    0.3 1.5")

def rowhouse(X,v):
    X = mat(X)
    v = mat(v)
    X = X - 2*v*v.T/(v.T*v)*X
    return X

def householder(X0):
    X = mat(X0.copy())
    m, n = shape(X)
    v = mat(zeros((m,1)))
    for j in range(1, n+1):
        v[j-1:m] = house(X[j-1:m,j-1])
        X[j-1:m,j-1:n] = rowhouse(X[j-1:m,j-1:n], v[j-1:m])
    return X
print("X=")
print(X)
print("v=")
print(v)
print("XHouse=")
print(householder(X))
```

'-----Problem 6-----'
X=
[[1.4 4.5 6.5]
 [5.8 3.2 7.3]

```
 [ 2.3 -2.6  8.2]
 [ 8.1 -5.8 -8. ]
 [ 9.   0.3  1.5]]
v=
[[1.  ]
 [0.38]
 [0.15]
 [0.54]
 [0.6 ]]
XHouse=
[[-1.37e+01  1.85e+00 -1.39e+00]
 [ 8.88e-16 -8.22e+00 -9.82e+00]
 [ 0.00e+00 -4.44e-16 -1.14e+01]
 [ 1.78e-15 -1.78e-15  0.00e+00]
 [ 1.78e-15  0.00e+00  0.00e+00]]
```