Mat 494 Homework

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1.2: Elements of Linear Algebra

```
% 1.2.1: Linear Spaces

% Linear Combination Example
v1=[8;6]
v2=[8;2];
c1=5;
c2=3;

LC=c1*v1+c2*v2

% Linear independence Example
v3 = [4;3];

det([v1 v2])
det([v1 v3])
det([v2 v3])

% Since v1 and v3 is the only combination which has determinant equal to 0
% they are the only linearly dependent vectors of the three.
```

```
v1 =

     8
     6


LC =

    64
    36


ans =

   -32


ans =
```

```
     0


ans =

    16
```

1.2.2: Orthogonality

```
v4=[3;-4];

dot(v1, v2)
dot(v1,v3)
dot(v1,v4)

% v1 is only orthogonal to v4 since dot product equals 1

% Gram-Schmidt Process
A=[4 7;5 3];
[m,k]=size(A);
Q=zeros(m,k);
R=zeros(k,k);
for i=1:k
    v=A(:,i);
    for j=1:i-1
        R(j,i)=Q(:,j)'*A(:,i);
        v=v-R(j,i)*Q(:,j);
    end
    R(i,i)=norm(v);
    Q(:,i)=v/R(i,i);
end

v


ans =

    76


ans =

    50


ans =

     0


v =
```

```
    2.8049
   -2.2439
```

1.2.4: Eigenvalues and Eigenvectors

```
A = [5 2;6 5];
ev = eig(A)
[V,D] = eig(A)

% Outputs ev (eigenvalues), V (eigenvectors), D (Diagonal Matrix)
```

```
ev =

    8.4641
    1.5359


V =

    0.5000   -0.5000
    0.8660    0.8660


D =

    8.4641         0
         0    1.5359
```

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