Lesi Li

Kenan Li

Amath 352

07/06/2020

HW2

Question 1:

(a) To check whether null(A) is a vector space, we need to check whether it satisfies the following three conditions. Null(A)={v | Av=0}.

  (1) A*0=0, therefore, 0 ∈ null(A)

  (2) Suppose v1 ∈ null(A), v1 ∈ null(A), then A*v1=0; A*v2=0.

  A(v1+v2)=A(v1)+A(v2)=0+0=0

  ∴v1 & v2 ∈ null(A)

  (3) If u ∈ null(A), c ∈ null(A), then cu ∈ null(A) too.

  If Au=0, then A(cu)=c*(Au)=c*0=0

∴ Null(A) is a vector space

(b) To find null(A), we do reduce echelon form of matrix A.

A=[1 2 3 1; 2 1 3 -1; 0 2 2 2] ~ A=[1 2 3 1; 0 1 1 1; 0 2 0 0]

Therefore, x3, x4 is the free variable.

Null (A) = {[-1 -1 1 0], [1 -1 0 1]}

To find orthogonal bases, u1=[-1 -1 1 0], u2=[1 -1 0 1].

q1=u1/ ||u1||=(1/√3)*[-1 -1 1 0]

q’2=v2-(v2*q1)*q1=[1 -1 0 1];

q2=q’2/||q’2||=(1/√3)[1 -1 0 1];

Therefore, the orthogonal bases for null(A) is {(1/√3)*[-1 -1 1 0], (1/√3)[1 -1 0 1]}

Question 2

A=[1 2 3; 2 1 3; 0 2 2]; β1={[1 0 0]; [0 1 1]; [0 -1 1]}; β2={[0 0 1]; [0 1 0]; [1 0 0]}

β1[T] β2 = S1^(-1)*A*S2 = [1 0 0; 0 ½ ½ ; 1 -½ ½] * [1 2 3; 2 1 3; 0 2 2] * [0 0 1; 0 1 0; 1 0 0]

= [3 2 1; 5/2 3/2 1; -½ ½ -1]

```
>> [3 2 1; 5/2 3/2 1; -1/2 1/2 -1]

ans =

    3.0000    2.0000    1.0000
    2.5000    1.5000    1.0000
   -0.5000    0.5000   -1.0000
```

β2[T] β1 = S2^(-1)*A*S1 = [0 0 1; 0 1 0; 1 0 0] * [1 2 3; 2 1 3; 0 2 2] * [1 0 0; 0 1 -1; 0 1 1]

= [0 4 0; 2 4 2; 1 5 1]

```
>> [0 4 0; 2 4 2; 1 5 1]

ans =

     0     4     0
     2     4     2
     1     5     1
```

Question 3:

```
%%
% Question 3

A=randn(3,3);
b=randn(3,1);
x=A\b;

xx=inv(A)*b;

xxx=zeros(3,1);

A1=A;
A1(:,1)=b;
xxx(1)=det(A1)/det(A);

A2=A;
A2(:,2)=b;
xxx(2)=det(A2)/det(A);

A3=A;
A3(:,3)=b;
```

xxx(3)=det(A3)/det(A);

format long

x

xx

xxx

```
x =

   -0.294960670184430
    0.171055942069621
   -0.488567763301531

 xx =

   -0.294960670184430
    0.171055942069621
   -0.488567763301531


xxx =

   -0.294960670184430
    0.171055942069621
   -0.488567763301531
```

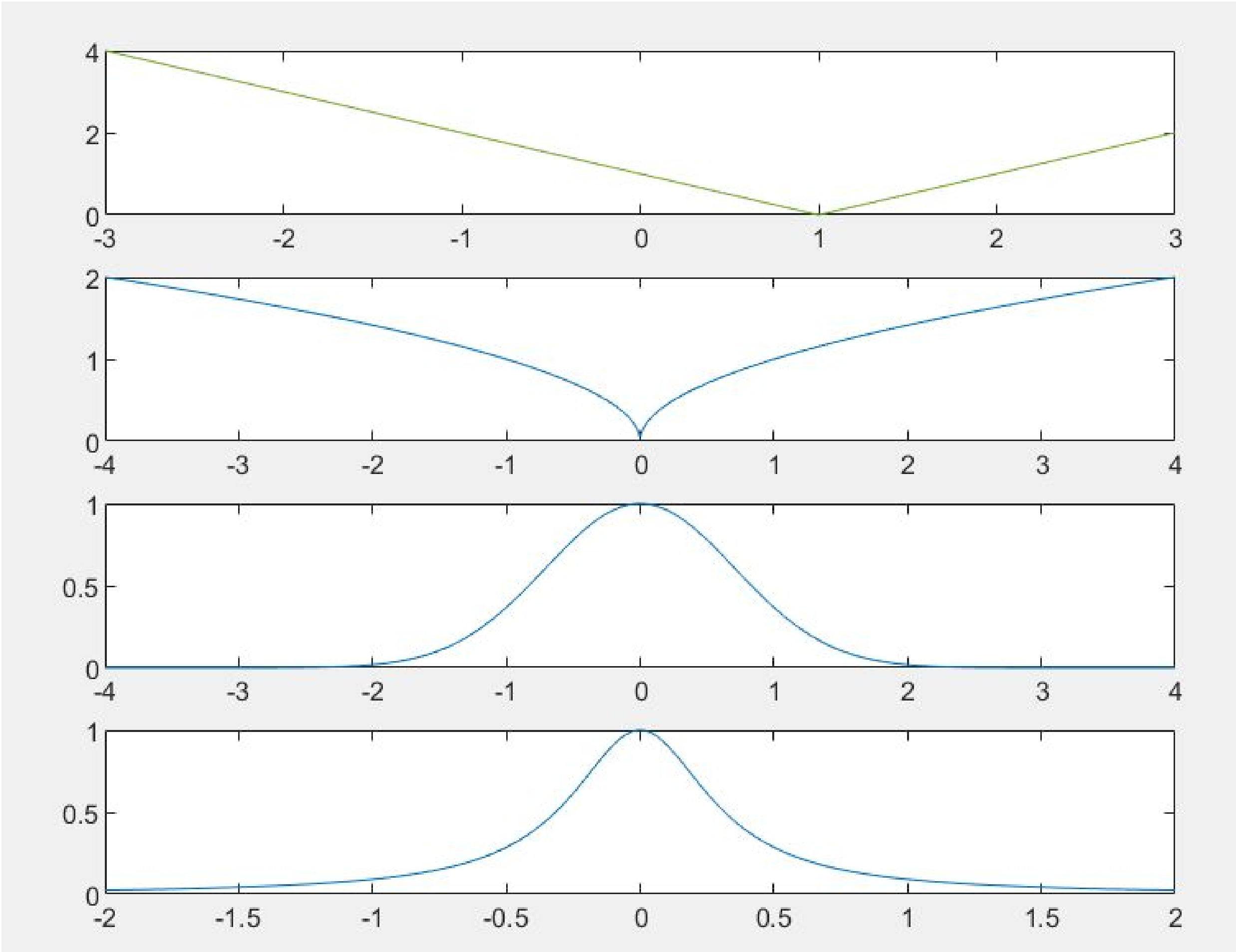
Question 4:

```
%%
% Question 4 (p.36, problem 6)
x1=-3:3;
y1=abs(x1-1);
subplot(4,1,1);
plot(x1,y1);
hold on

x2=-4:4;
y2=sqrt(abs(x2));
subplot(4,1,2);
plot(x2,y2);

y3=exp(-x2.^2);
subplot(4,1,3);
plot(x2,y3);

x4=-2:2;
y4=1./(10*(x4.^2)+1);
subplot(4,1,4);
plot(x4,y4);
```



Question 5:

(a)

```
% YODA      Load low or high resolution model of Yoda character.
%           and rotate model about x, y, or z axis.
%
% Code created by Tim Chartier - June 2006
% Models created by Kecskemeti B. Zoltan.
% Images courtesy of Lucasfilm LTD.
```

```
%% Load the model/tessellation information

load yodapose_low

% load yodapose    % uncomment to use higher resolution model of Yoda


%% Create initial plot

Vt = V;

clf

patch('Vertices',Vt,'Faces',F3,'FaceColor',[.76 .87 .78]);

patch('Vertices',Vt,'Faces',F4,'FaceColor',[.76 .87 .78]);

axis tight equal vis3d

drawnow


%% Create translation matrix


slides = 48;


% Create the translation matrix

yMinValue = min(V(:,2,:));  % Find minimum y value in the model

axisValues = axis;          % Get the min and max values on each axis

yAxesMax = axisValues(4);   % Get the upper limit on the y-axis

shift = (yAxesMax - yMinValue)/slides;  % Create a shift that

                            % will have animation exit axes on last frame
```

```
[n,m] = size(V);

T = [zeros(n,1),shift*ones(n,1),zeros(n,1)];  % translation matrix


%% Animate translation

theta=pi/24;

R=[cos(theta) 0 -sin(theta); 0 1 0; sin(theta) 0 cos(theta)];


for i=1:slides

   Vt = Vt*R;

   cla

   patch('Vertices',Vt,'Faces',F3,'FaceColor',[.76 .87 .78]);

   patch('Vertices',Vt,'Faces',F4,'FaceColor',[.76 .87 .78]);

   axis(axisValues)

   drawnow

end
```

(b) 33862*3*3=304758