K=2; % K is the parameter for determinig the shape of the function

Q=30; %angles of movement direction for the first question

N=4;

u\_for\_four\_neuron = [ 0 90 180 270 ]; %preferred direction

rad\_u\_for\_four\_neuron = u\_for\_four\_neuron.\*(pi)/180; % changed everything into radians since cos

%used with radians.

res= tune\_func(pi/6,2,rad\_u\_for\_four\_neuron);

%------------------------------ Answer 1 ended ---------------------------

% N= the number of neurons

% C\_i = preferred direction of the ith neuron

% r\_i= firing rate

% v= decoded movement direction

vec\_u\_for\_four\_neuron = [ 1,0 ; 0,1 ; -1,0 ; 0,-1 ];

neural\_fires = [ 1 0 2 7 ];

decoded\_moving\_direction = population\_vector(neural\_fires,vec\_u\_for\_four\_neuron);

% ----------------------------- Answer 2 ended -------------------------

%

for i=1:24

for j=1:4

store\_all(i,j)=tune\_func(movingDirection(1,i),2,rad\_u\_for\_four\_neuron(j));

end

end

figure();

subplot(2,2,1);

plot(movingDirection, store\_all(:,1));

title('spikerate in terms of the moving direction 1st')

subplot(2,2,2);

plot(movingDirection, store\_all(:,2));

title('spike rate in terms of the moving direction 2nd')

subplot(2,2,3);

plot(movingDirection, store\_all(:,3));

title('spike rate in terms of the moving direction 3rd')

subplot(2,2,4);

plot(movingDirection, store\_all(:,4));

title('spike rate in terms of the moving direction 4rth')

% ------------------------------ Answer 3a ended --------------------------

for i=1:6

decoded\_moving\_direction\_matrix(i,:)= population\_vector(neuralFiring(i,:),vec\_u\_for\_four\_neuron);

end

figure()

plotTrajectory(decoded\_moving\_direction\_matrix)

title('Trajectory of decoded moving direction matrix')

% ----------------------------- Answer 3b ended ---------------------------

function y=tune\_func(Q,K,u)

y=exp(K\*cos(Q-u));

end

function y=population\_vector(rate\_r,u)

y1=zeros(size(u));

for i= 1:4

y1(i,:)= rate\_r(i).\*u(i,:);

end

sum\_down=cumsum(rate\_r);

total\_down=sum\_down(size(u,1));

sum\_up=sum(y1);

y=sum\_up/total\_down;

end

% ---------------------------- functions ---------------------------