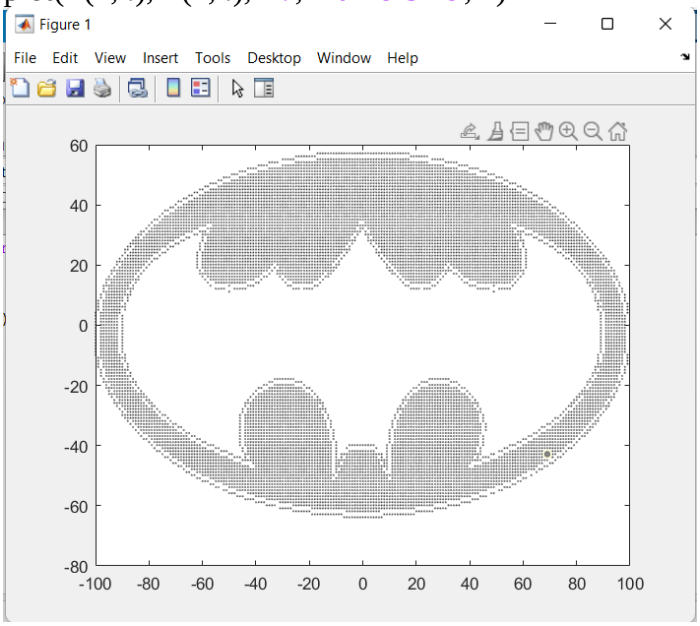
Emil Ulvagården
Linear algebra, 1MA406

Matlab

Exercise 4:

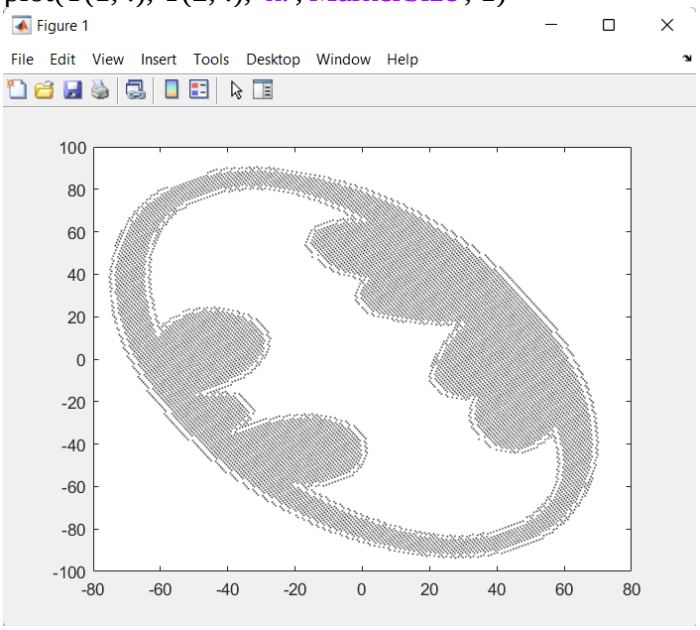
Part a:

```
load('batman.mat')
p = [1 0; 0 -1];
T = p * B;
plot(T(1, :), T(2, :), 'k.','MarkerSize', 1)
```



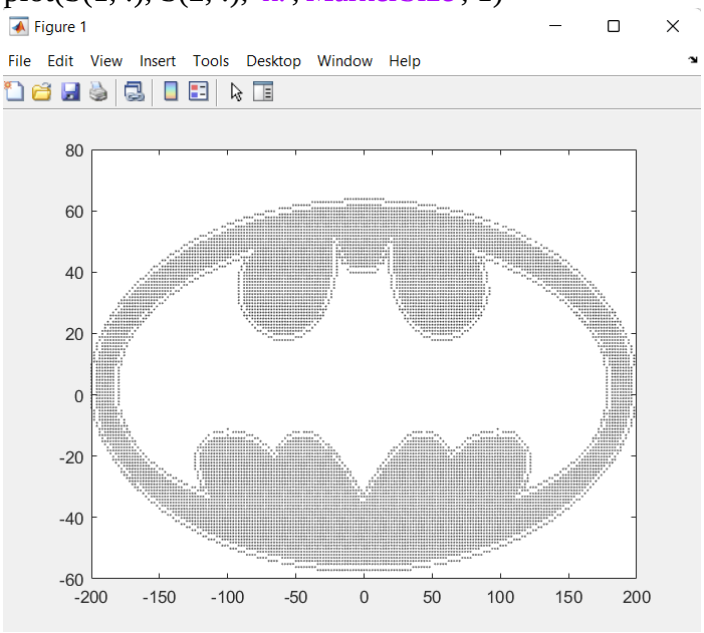
Part b:

```
load('batman.mat')
a = [cos(2*pi/3) -sin(2*pi/3); sin(2*pi/3) cos(2*pi/3)];
T = a * B;
plot(T(1, :), T(2, :), 'k.','MarkerSize', 1)
```



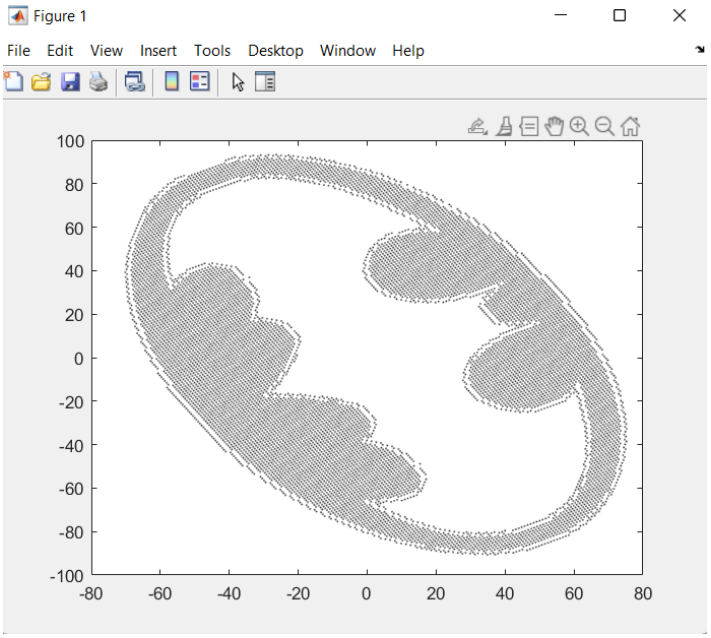
Part c:

```
load('batman.mat')
a = [2 0; 0 1];
S = a * B;
plot(S(1, :), S(2, :), 'k.','MarkerSize', 1)
```



Part d:

```
load('batman.mat')
a = [-1 0; 0 1];
c = [cos(pi/3) -sin(pi/3); sin(pi/3) cos(pi/3)];
r = c * B;
R = a * r;
plot(R(1, :), R(2, :), 'k.','MarkerSize', 1)
```



Exerciese 5:

Data:

```
rng(7)
n = 30;
center = [0 0];
radius = 1;
eps = 0.1;
r = eps * rand (n ,1) + radius - eps /2;
A = [center(1)+r.*cos(2*pi*(1:n)'/n) center(2)+r.*sin(2*pi*(1:n)'/n)];
```

Part a:

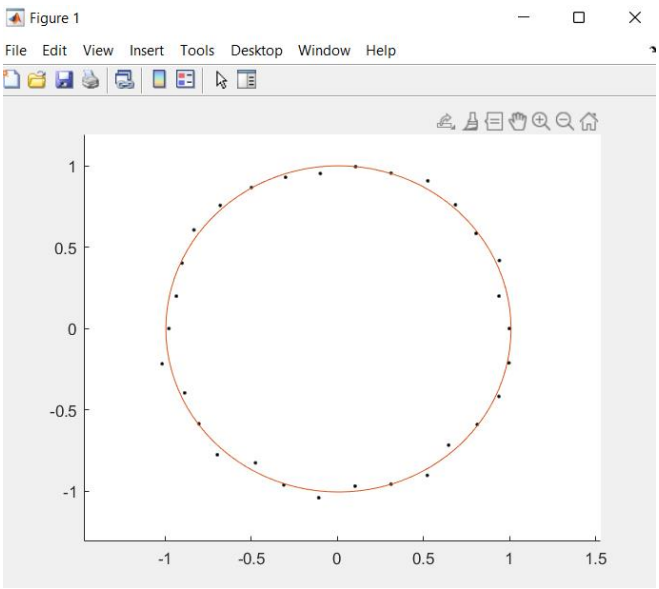
```
b = A(:,1).^2 + A(:,2).^2;
A1 = [A(:,1).*2, A(:,2).*2];
A1(:,3)=ones;
c = A1\b
```

c1 = 0.0050
c2 = -0.0021
c3 =1.0035

Part b:

```
radius2 = sqrt(c(3) + c(2)^2 + c(1)^2)

hold on
plot(A(:,1),A(:,2),'k.');
th = 0:pi/50:2*pi;
xunit = radius2 *cos(th) + c(1);
yunit = radius2 * sin(th) + c(2);
plot(xunit, yunit)
hold off
```



Part c:

MSE = sum((radius2^2 - (A(:,1)-c(1)).^2 - (A(:,2)-c(2)).^2).^2)/30
MSE = 0.0033
Det optimala resultatet skulle vara 0 för då har all punkter i snitt samma avstånd till den rediga cirkeln.

Exerciese 6:

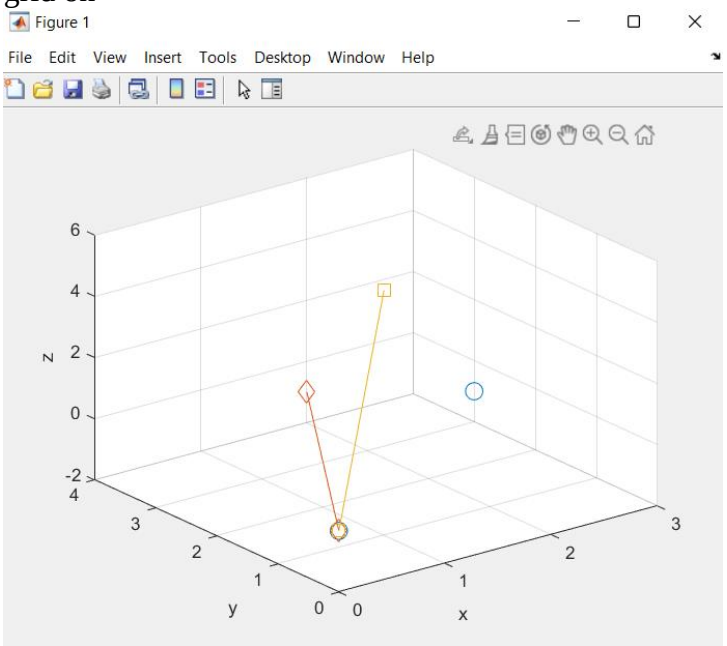
Part a:

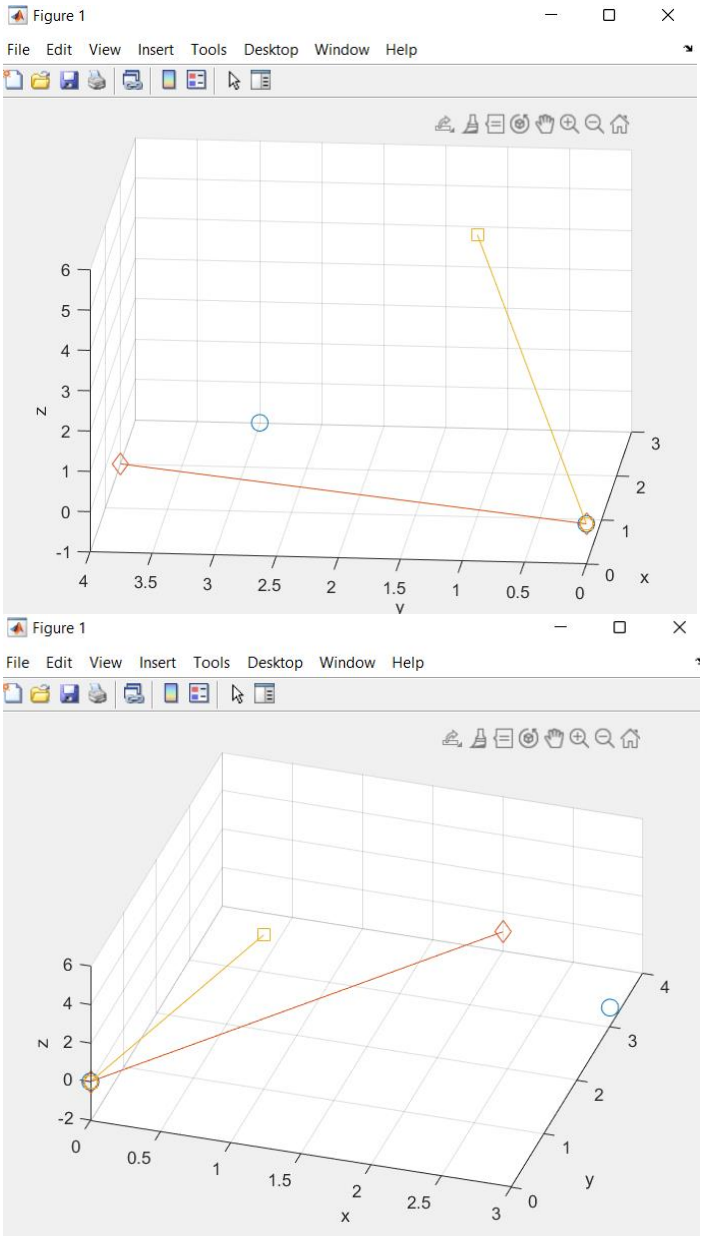
```
u = [3, 3,-1];
v = [2, 4,-1];
w = cross(u,v);

% equation of plane x + y + 6z = 0
% P1 = (6, 6, -2)
% P2 = (6, -6, 0)
% P3 = (-6, -6, 2)
% P4 = (-6, 6, 0)
```

Part b:

```
origin = [0,0,0];
hold on
plot3([origin(1) u(1)], [origin(2) u(2)], [origin(3) u(3)], 'o', ...
   [origin(1) v(1)], [origin(2) v(2)], [origin(3) v(3)], '-diamond', ...
   [origin(1) w(1)], [origin(2) w(2)], [origin(3) w(3)], '-square', 'MarkerSize', 20)
grid on
```





Part c:

X = [6; 6; -6; -6]
Y = [6; -6; -6; 6]
Z = [-2; 0; 2; 0]
fill3(X, Y, Z, 'r', 'facealpha', 0.4)

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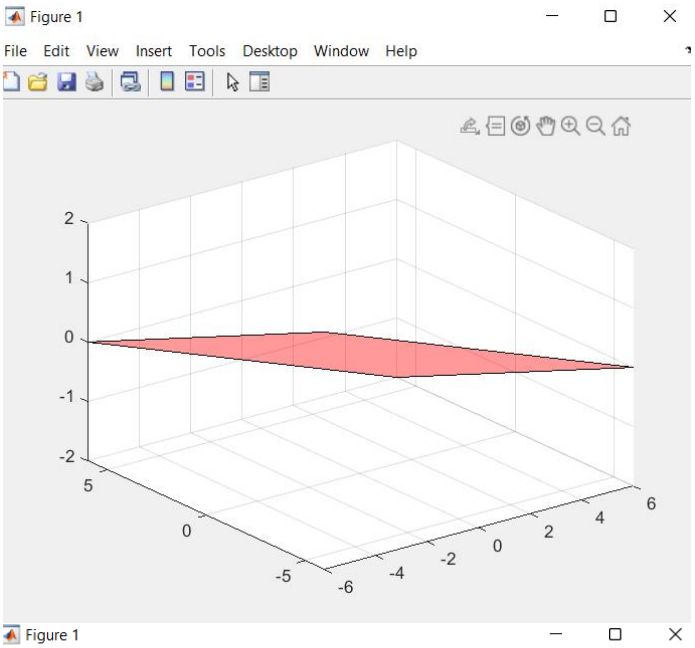
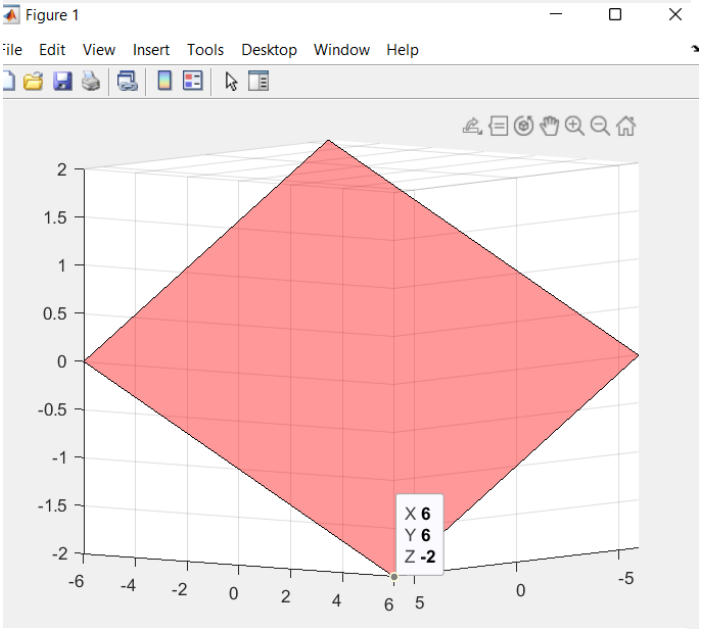
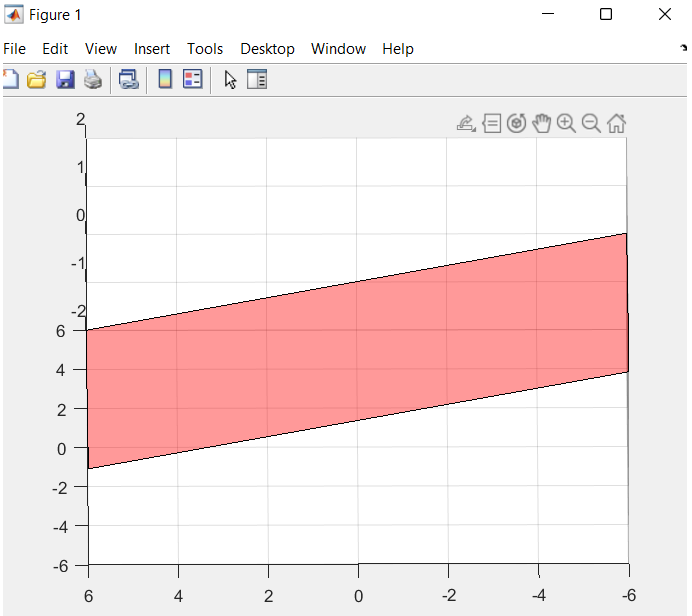


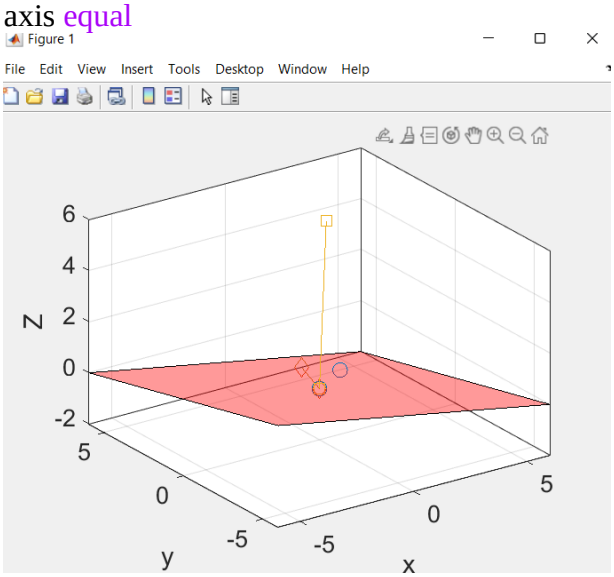


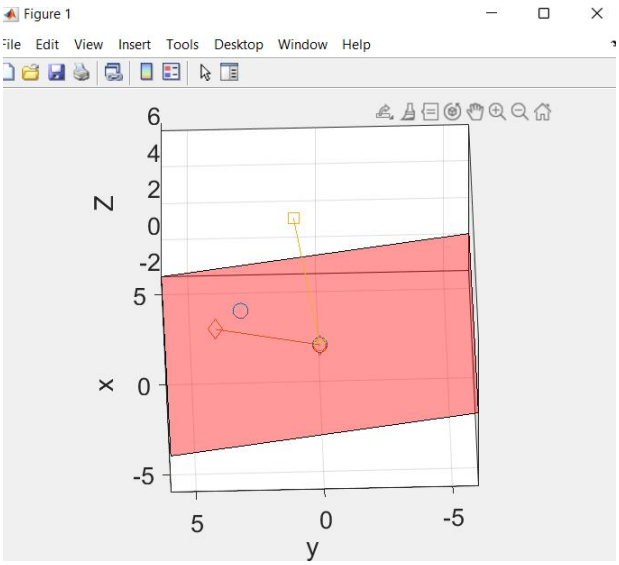


Part d:

```
origin = [0,0,0]
hold on
plot3([origin(1) u(1)], [origin(2) u(2)], [origin(3) u(3)], 'o', ...
    [origin(1) v(1)], [origin(2) v(2)], [origin(3) v(3)], '-diamond', ...
    [origin(1) w(1)], [origin(2) w(2)], [origin(3) w(3)], '-square', 'MarkerSize', 10)
grid on
xlabel('x'), ylabel('y'), zlabel('z')

X = [6; 6; -6; -6]
Y = [6; -6; -6; 6]
Z = [-2; 0; 2; 0]
fill3(X, Y, Z, 'r', 'facealpha', 0.4)
hold off
box on
grid on
set(gca,'fontsize',16)
axis equal
```





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