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Prob - 7

```
clc; clear; close all;

P  = [1 0.5;0.5 2];
alpha  = 0.01;
```

Threshold

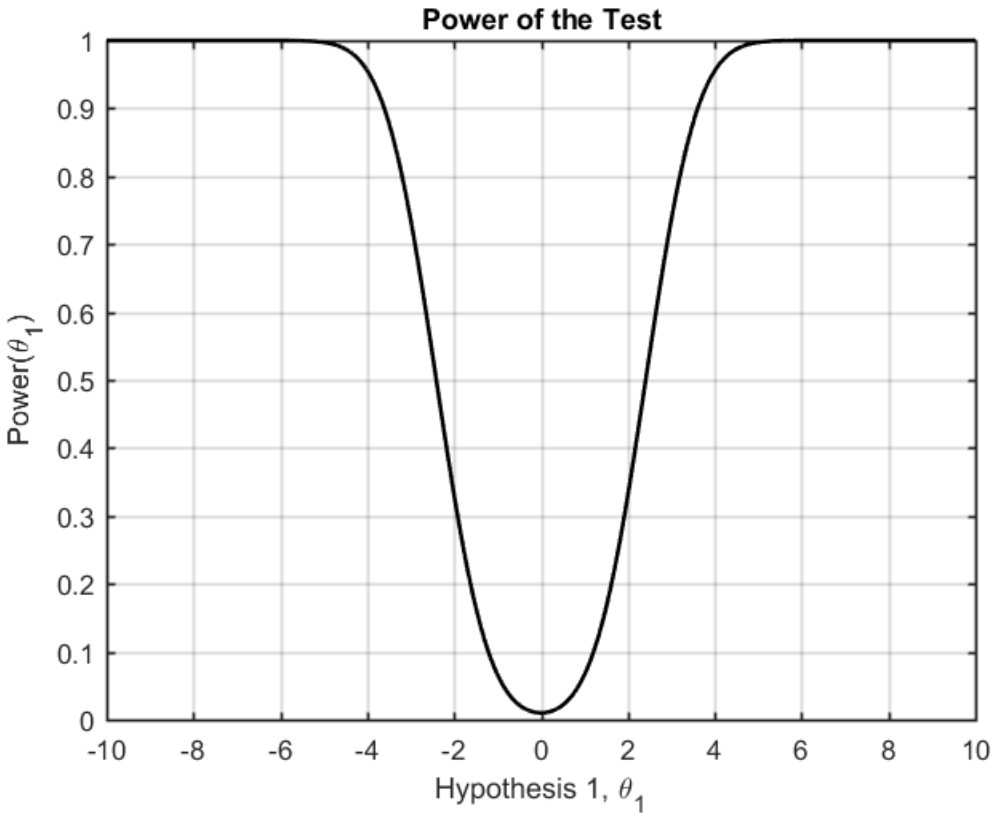
```
mu_beta_z = @(theta_1) sum(sum(inv(P)))*theta_1;
Var_beta_z = sum(sum(inv(P)));

beta_0  = -norminv(alpha/2,mu_beta_z(0),sqrt(Var_beta_z));

disp('Threshold \beta_0:')
disp(beta_0)
```

```
Threshold \beta_0:
    2.7537
```

Power of test

```
theta_1_vec = -10:0.01:10;

mu_beta_z_vec = mu_beta_z(theta_1_vec);

power_vec = zeros(1,length(theta_1_vec));

for nn = 1:length(theta_1_vec)
    power_vec(nn)  = normcdf(-
beta_0,mu_beta_z_vec(nn),sqrt(Var_beta_z));
    power_vec(nn)  = power_vec(nn) + 1-
normcdf(beta_0,mu_beta_z_vec(nn),sqrt(Var_beta_z));
end

figure;
plot(theta_1_vec,power_vec,'Color','k','Linewidth',1.5)
xlabel('Hypothesis 1, \theta_1');
ylabel('Power(\theta_1)');
title('Power of the Test')
        grid on
```

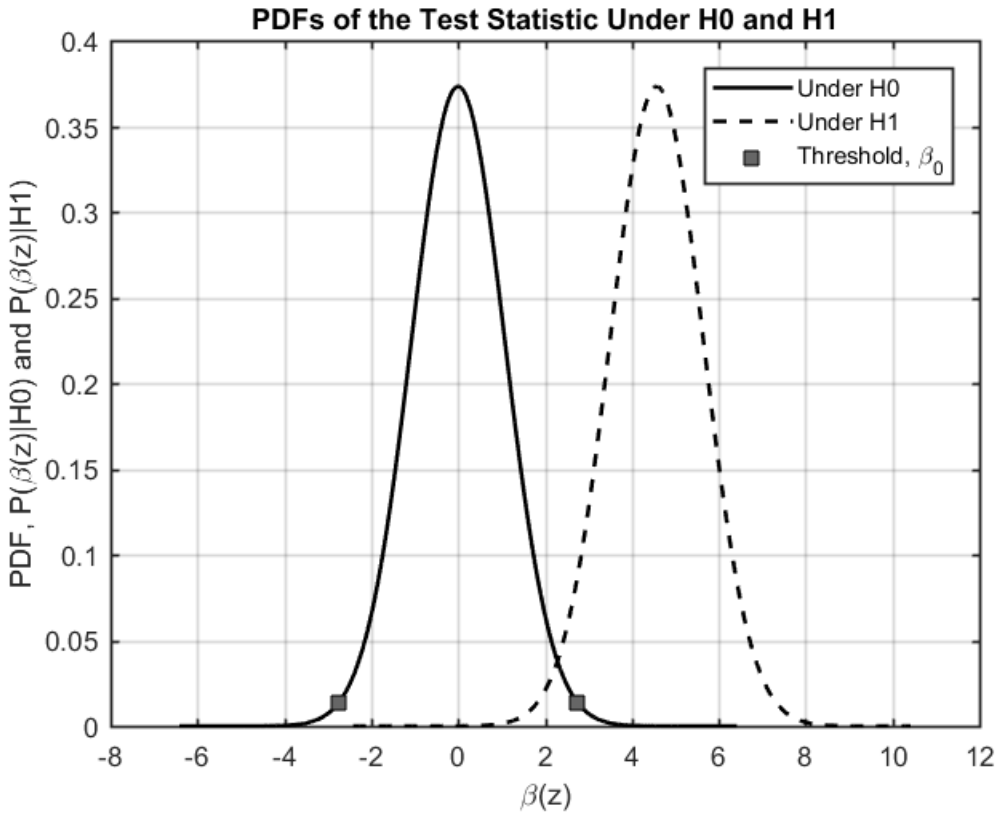
```
ax = gca;
ax.LineWidth = 1;
ax.GridColor = [0 0 0];
ax.MinorGridColor = 'k';
```



beta|H0 and beta|H1 PDFs

```
six_sigma = 6*sqrt(Var_beta_z);

del_beta_z_vec = linspace(-six_sigma,six_sigma,2000);

theta_1 = 4;
x_H0_vec = del_beta_z_vec;
x_H1_vec = del_beta_z_vec+theta_1;

pdf_beta_z_H0 = normpdf(x_H0_vec,mu_beta_z(0),sqrt(Var_beta_z));
pdf_beta_z_H1 = normpdf(x_H1_vec,mu_beta_z(theta_1),sqrt(Var_beta_z));
pdf_beta_0 = normpdf([-beta_0 beta_0],mu_beta_z(0),sqrt(Var_beta_z));

figure;
plot(x_H0_vec,pdf_beta_z_H0,'Color','k','Linewidth',1.5);hold on;
plot(x_H1_vec,pdf_beta_z_H1,'--','Color','k','Linewidth',1.5);
plot([-beta_0 beta_0],pdf_beta_0,'s','MarkerSize',7,...
    'MarkerEdgeColor','k',...
    'MarkerFaceColor',[0.4,0.4,0.4])
xlabel('\beta(z)');
```

```
ylabel('PDF, P(\beta(z)|H0) and P(\beta(z)|H1)');
title('PDFs of the Test Statistic Under H0 and H1')
legend('Under H0','Under H1','Threshold, \beta_0')
    grid on
    ax = gca;
    ax.LineWidth = 1;
    ax.GridColor = [0 0 0];
    ax.MinorGridColor = 'k';
% axis tight
```



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