Student name: CHUNG QUANG KHANH

Student ID: 20245360

Homework #4

Prof. SUH

1. Find ,

1. Draw 90% ellipse using (, )

A graph with a red cross

Description automatically generated

MATLab source code:

|  |
| --- |
| clc, clearvars, close all  % measurement: m = 1  n = 2; % state variables  A = [ 1 0;  0 1 ]; % n x n  d = [ 5 5 ]';  Q = [ 1 0.5;  0.5 1 ]; % n x n  H = [ 1 0 ]; % m x n  R = 1; % m x m  xh0 = [ 0 0]';  P0 = eye(n);  z = [4 9 16];  N = length(z);  xh\_result = zeros(n, N);  P\_result = zeros(n, n, N); % array of N matrices, each matrix is n x n  % Run Kalman filter  xh = xh0;  P = P0;  for k = 1:N  % Time update stage  xh\_minus = A\*xh + d; % Prediction of state  P\_minus = A\*P\*A' + Q; % Prediction of error covariance    % Measurement update stage  K = P\_minus\*H'\*inv(H\*P\_minus\*H' + R); % Computation of Kalman gain  xh = xh\_minus + K\*(z(k) - H\*xh\_minus); % Computation of estimate  P = (eye(n) - K\*H)\*P\_minus; % Computation of error covariance    % Save results after each round  xh\_result(:, k) = xh;  P\_result(:, :, k) = P;  End  % Show the results  disp('xh\_3 ='); disp(xh\_result(:, 3));  disp('P\_3 = '); disp(P\_result(:, :, 3));  % Draw the results  C = P\_result(:, :, 3);  m = xh\_result(:, 3);  K = 4.61; % Look up table with n = 2, Prob = 0.9  r = draw\_ellipse(C, m, K);  plot(r(1,:), r(2,:), m(1), m(2), 'r\*'); |