Try the problems we did in the maths help sessions:

1 Consider a vector u of p dimensions and a matrix P constructed as P = u\*u^t . Explain why P x is a vector pointing in the same direction as x. What effect does the matrix 2P I have when multiplying a vector x. Draw a sketch to illustrate your answer.

2 Let u and v be vectors in R3. Let k = ||u|| and l = ||v||. Show that the vector

w = lu + kv

bisects the angle between u and v.

Try the problem we did in the maths help sessions:

1 Set up a system of linear equations for the following problem and then solve it: The three-digit number N is equal to 15 times the sum of its digits. If you reverse the digits of N, the resulting number is larger by 396. Also, the units (ones) digit of N is one more than the sum of the other two digits. Find N.

2 A symmetric matrix A can be diagonalized as A = S D S−1 Can the repeated multiplication of A n be done efficiently using this relationship?

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The method of Lagrange multipliers is very powerful. In this module, we use this technique for deriving principal components and support vector machines.

Try the problems:

1 Find the maximum and minimum values of the function f (x, y) = xy, subject to the constraint x 2 + y 2 = 8. Use MATLAB to plot the function f (x, y) (3D or contours on it) over some convenient range and illustrate your answer.

2 An editor has been given 60, 000 to spend on the development and promotion of a new book. An empirical study has found that if x thousand dollars is spent on development and y thousand on promotion, approximately f (x, y) = 20x 3/2 y copies of the book will be sold. How much money should the editor allocate to development and how much to promotion in order to maximize sales?