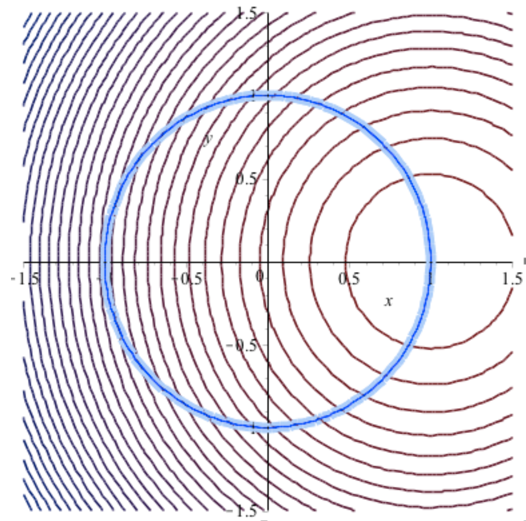
1. From DVC: 1.26, 12.2, 12.8, 12.11, 12.20, 13.1, 13.3, 13.4, 13.5, 13.6, 13.17, 13.21(a), 14.4, 14.5, 14.6, 14.8, 14.9, 14.10, 14.19.

2. Explain, in your own words and using illustrations, why the method of Lagrange multipliers works. Your explanation does not need to be a rigorous proof, but should be enough to help a classmate (who had not yet read Chapter 14) understand the reasoning behind the technique.

3. (a) Below is a contour plot of a function $f(x, y)$. Determine the points (x, y) where f, under its restriction to the blue curve, takes extreme values. Explain your reasoning.



   (b) Verify your solution to part (a) using the method of Lagrange multipliers. The function

$$f(x, y) = x^2 + y^2 - 2x + 1$$

   and the blue contraint curve is the solution set to the equation $x^2 + y^2 = 1$.
   (Hint: Don't divide by zero!) Identify the maximum and minimum values of $f(x, y)$ subject to the constraint $x^2 + y^2 = 1$.

   (c) Again verify the calculation by parameterizing the blue curve $x^2 + y^2 = 1$ and using the first derivative test (as in Proposition 13.1).

4. (a) Compute the inverse of the matrix $\begin{bmatrix} 3 & -1 & -1 \\ -1 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$.

   (b) Determine the eigenvalues of the following matrix, and compute the associated eigenspaces.

$$A = \begin{bmatrix} 5 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 5 \end{bmatrix}$$

   (c) Choose an eigenbasis for the matrix in part (b). Write the vector $\mathbf{e}_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ as a linear combination of these eigenvectors.

   (d) Compute $A^{100}\mathbf{e}_1$. *Hint: Use part (c). You do not have to compute any matrix powers.*