

1. $f(x_1, x_2) = 3x_1^2 - 1.5x_1x_2 - 2x_2^2 + x_1 - 2x_2 + 4$. Draw $f(x_1, x_2)$ within $[-\pi, \pi]^2$.
2. Let x denote an $N \times 2$ matrix, where $x(i, :)$ denotes a random point in $[-\pi, \pi]^2$. Let y denote an $N \times 1$ vector, where $y(i) = f(x(i,1), x(i,2))$.
 - A. Write a Matlab script to generate x and y .
 - B. Plot 3D points defined by x and y .
3. Let c_1, \dots, c_6 denote six coefficients in $f(x_1, x_2)$. Then $f(x(i,1), x(i,2))$ specifies a linear combination of these coefficients. Assume these six coefficients being unknown. Let $c = [c_1, \dots, c_6]^T$.
 - A. $f(x(i,1), x(i,2)) = y(i)$ states a linear constraint for determining coefficients in c . Write Matlab statements to form a matrix A , where row $A(l,:)$ times c is expected to equal $y(i)$.
 - B. Write Matlab statements to determine $B = A'A$.
4. Find the reduced echelon form of $[B \ I]$ and the inverse of B .
5. Solve $Bc = A'y$ by multiplying the inverse of B to $A'y$.
6. Let $y(i) = f(x(i,1), x(i,2)) + n_i$, where n_i is a noise within $[-0.1, 0.1]$. Repeat 2–5 to find vector c .