

## Practice on Least Squares Problems

(1) Construct the normal equations for 
$$\begin{bmatrix} -1 & 2 \\ 2 & -3 \\ -1 & 3 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 4 \\ 1 \\ 2 \end{bmatrix}.$$

(2) Find the least squares solution  $\hat{\mathbf{x}}$  to the system in the previous problem.

(3) Plot the points  $(-2, 2), (-1, 1), (0, 0), (1, 1), (2, 2)$ , and then find the parabola  $y = ax^2 + bx + c$  that best fits the points in the least squares sense.

(4) Find the exponential curve  $y = Ae^{Bx}$  that best fits the points  $(0, 1), (1, 1), (2, 2)$  in the least squares sense. Hint: rewrite the relationship between  $x$  and  $y$  as  $\ln(y) = \ln(A) + Bx$ .