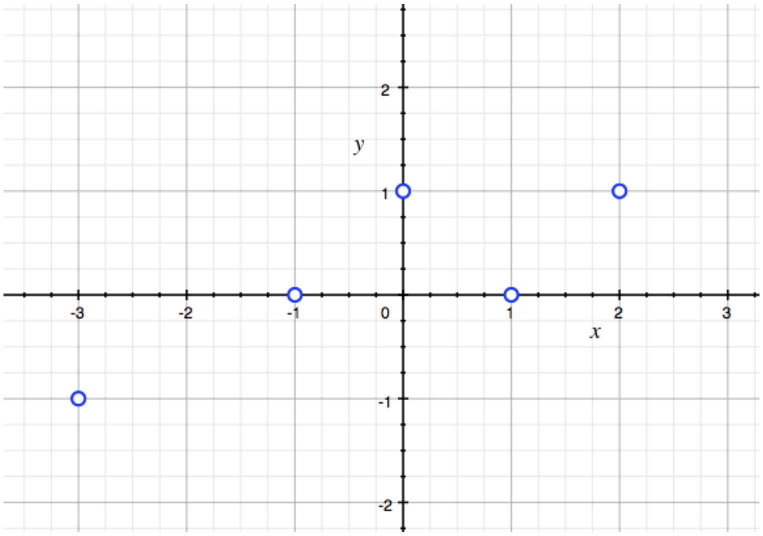
# 14.7-8: Optimization

Friday, March 11

## Return of the Best Fit Line

Given the five points (-3,-1), (0,1), (-1,0), (1,0), and (2,1), we would like to find the line of the form $y = ax+b$ that best approximates the data. If our goal is to minimize the sum of the squared errors, our error function will be $E(a,b) = \sum_i (ax_i + b - y_i)^2 = 15a^2 + 5b^2 + 3 - 2ab - 2b - 10a$. Find the optimal pair $(a, b)$ and plot the appropriate line.




## Maxima and Minima

Find the shortest distance from the point $(2, 0, -3)$ to the plane $x + y + z = 1$.

Minimize the function $f(x, y) = x^2 + 3y^2 - 4x - 12y + 16$ given the constraints $-1 \leq x \leq 1, -1 \leq y \leq 1$.

## Lagrange Multipliers

Find the maximum and minimum attainable values of $f(x, y) = xy$ subject to the contraint $4x^2 + y^2 = 8$.

Find the points on the ellipse $(x-1)^2 + 4(y-2)^2 = 1$ with the maximum and minimum distances from the origin.

Find the shortest distance from the point $(2, 0, -3)$ to the plane $x + y + z = 1$, this time by using Lagrange multipliers. What does this have to do with the distance formulas from chapter 12?