Math 415 Lecture 17

Chapter 4

Sec 4.1 (Mar. 3) Minimization Problems

Solve

$$f_1(x) = 0, \ \ldots, \ f_m(x) = 0, \quad x \in \mathbb{R}^n \qquad (*)$$

Set

$$p(x) = (f_1(x))^2 + \cdots + (f_m(x))^2$$

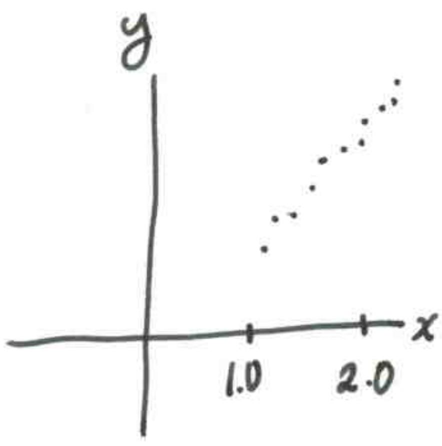
So $p(x) \geq 0$ and $p(x) = 0$ only if x satisfies $(*)$. So sol'ns also satisfy

$$\underset{x \in \mathbb{R}^n}{\text{minimize}}\ p(x).$$

If the minimum is zero, we have sol'ns. What if it isn't? Then no sol'n. But we can use $p(x)$ to measure the degree to which the problem cannot be satisfied.

Data Fitting

x	y
1.0	$\longrightarrow y_1$
1.1	See graph y_2
1.2	
$\vdots$	$\vdots$
2.0	y_{11}



Can we fit $y = mx + b$ to the data? What does this mean?

$y_1 = m \cdot 1 + b$

$y_2 = m \cdot 1.1 + b$

$y_3 = m \cdot 1.2 + b \ \cdots \quad y_{11} = m \cdot 2 + b$ No sol'n.

But closeness makes sense.