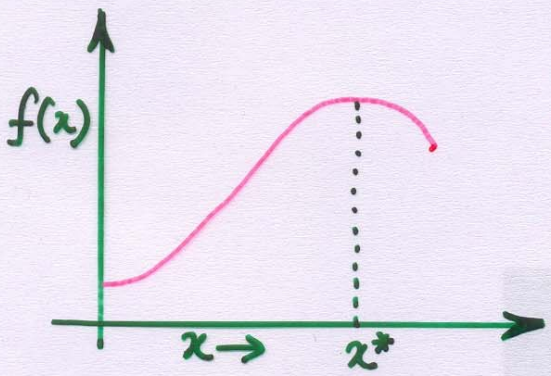
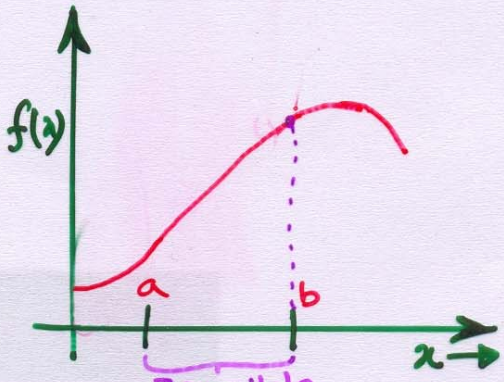
CONSTRAINED OPTIMIZATION



Maximize $f(x)$



Feasible range for x

Maximize $f(x)$
s.t. $a \leq x \leq b$

LAGRANGEAN METHOD OF SOLVING PROBLEMS WITH EQUALITY CONSTRAINTS

Maximize (or minimize) $g(x)$

SUBJECT TO

$$h_j(x) = b_j \qquad \text{[NOTE THERE ARE J SUCH CONS.]}$$
$$x \geq 0$$

$$\mathcal{L}(x, \lambda_j) = g(x) - \sum_{\forall j} \lambda_j (h_j(x) - b_j)$$

$$\frac{\partial \mathcal{L}}{\partial x_i} = \frac{\partial g}{\partial x_i} - \sum \lambda_j \frac{\partial h_j}{\partial x_i} = 0 \qquad \text{(for all } i\text{)}$$

$$\frac{\partial \mathcal{L}}{\partial \lambda_j} = h_j(x) - b_j = 0 \qquad \text{(for all } j\text{)}$$

The resulting $(I+J)$ equations when solved gives the optimal values.

Note: I is the total number of variables
J is the total number of constraints