

Computational Methods and Modelling

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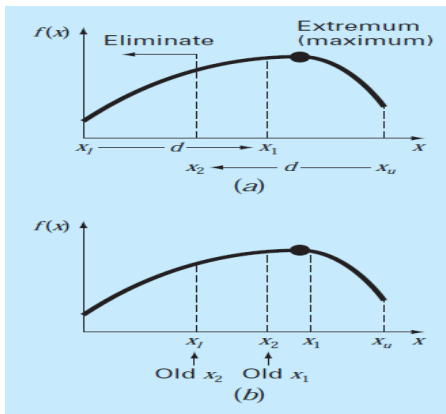
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Tutorial 11
Optimisation.



Exercise 1: Optimisation using Golden Search

- Maximise the function $f(x) = 2\sin(x) - x^2/10$ using Golden Search



Exercise 2: Optimization of spring system

- Calculate the displacement of the point (x_1, x_2) that minimises the potential energy of the spring system.

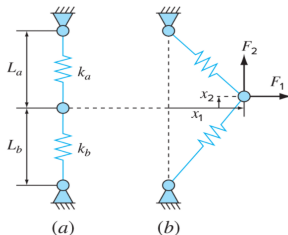


FIGURE 16.15 A two-spring system: (a) unloaded, and (b) loaded.

$$k_a = 9 \text{ N/cm}, k_b = 2 \text{ N/cm}, L_a = 10 \text{ cm}, L_b = 10 \text{ cm}, F_1 = 2 \text{ N}, \text{ and } F_2 = 4 \text{ N}.$$

$$\begin{aligned} PE(x_1, x_2) = & 0.5k_a \left(\sqrt{x_1^2 + (L_a - x_2)^2} - L_a \right)^2 \\ & + 0.5k_b \left(\sqrt{x_1^2 + (L_b + x_2)^2} - L_b \right)^2 - F_1 x_1 - F_2 x_2 \end{aligned}$$