

4.7 Optimization Problems

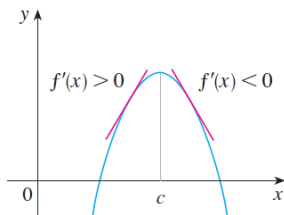
We now apply the methods learned to find the minimum and maximum of functions

1. elate the variables in the problem and obtain a function whose min/max will provide the answer.
Steps In Solving Optimization Problems:

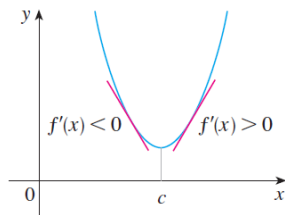
- Understand the Problem: The first step is to read the problem carefully until it is clearly understood. Ask yourself: What is the unknown? What are the given quantities? What are the given conditions?
- Draw a Diagram: In most problems it is useful to draw a diagram and identify the given and required quantities on the diagram.
- Introduce Notation: Assign a symbol to the quantity that is to be maximized or minimized (let's call it Q for now). Also select symbols say a, b, c, \dots, x, y for other unknown quantities and label the diagram with these symbols.

2. First derivative Test:

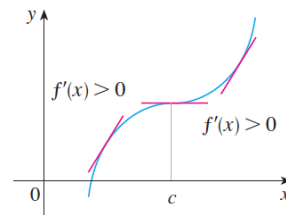
- if f' changes form positive to negative, then f has a local maximum on that interval
- if f' changes form negative to positive , then f has a local minimum on that interval
- if f' does not change sign on an interval, then f has no local extrema on that interval



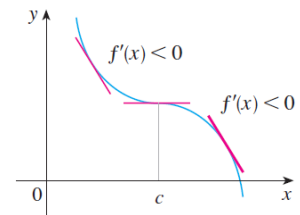
(a) Local maximum



(b) Local minimum



(c) No maximum or minimum



(d) No maximum or minimum