Chapter 4.2: Optimization

Calculus I

College of the Atlantic. October 27, 2022

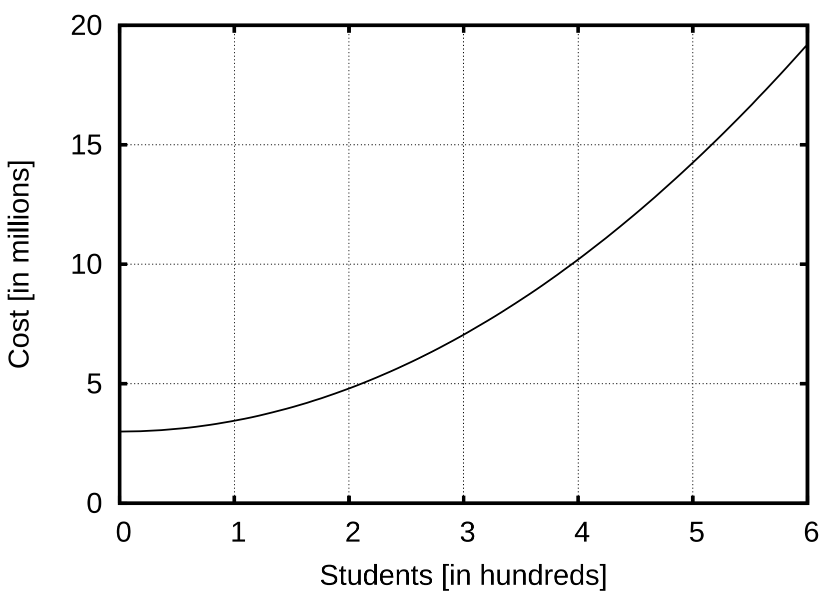
1. Let $g(x) = x^2 - 6x + 11$.
   (a) What is the global minimum and maximum of $g(x)$ on the interval $[1, 4]$?
   (b) What is the global minimum and maximum of $g(x)$ on the interval $[3, 4]$?

2. Consider $f(x) = xe^{-x^4}$, where x is always greater or equal to zero. What is the maximum value of $f(x)$? What is the minimum value?

3. Sketch a continuous function that has local minima at 2 and 4, a global maximum at 3, and no other extrema.

4. Sketch a continuous function that has no critical points but has an inflection point at $x = -2$.

5. In the figure is shown a plot of the cost of running a school as a function of the number of students.
   (a) What is the average cost per student if the enrollment is 100?
   (b) What is the average cost per student if the enrollment is 500?
   (c) What number of students leads to the lowest average cost per student?



6. A grapefruit is tossed straight up with an initial velocity of 50 ft/s. The grapefruit is 5 feet above the ground when it is released. Its height at time t is given by

$$h(t) = -16t^2 + 50t + 5 \ . \tag{1}$$

   (a) How high does it go before returning to the ground?
   (b) At what time does the grapefruit to reach its maximum height?