
MA104 - Differential Calculus
Lesson 15: Maximum And Minimum Values Of Functions

1. What steps should you take to find the extreme values of a continuous function on a closed interval (page 275)? What commands in Mathematica can help you implement these steps?

2. Find the critical numbers of the following functions (by hand).

(a) $f(t) = 2t^3 - 3t^2 - 36t + 4$

(b) $g(x) = 2\sqrt{x} - \frac{2}{3}x\sqrt{x}$

3. **Technology Problem** Do the following for the function $f(x) = (-2x^3 + 5\sqrt{x} + 4)^2$ on the interval $[0, 2]$.

(a) Plot the function and derivative of the function on the same graph.

(b) Use the `Solve` command to determine the critical numbers of the function.

(c) Determine function values at the critical numbers and at the endpoints of the interval.

(d) Classify all critical numbers and endpoints as having a local or absolute maximum or minimum value or neither.

4. **Technology Problem** Do the same steps as above for the function $g(x) = \sin^3(4x^2 + 3x)$ on the interval $[0, \pi/4]$.

- (a) What happens if you use the `Solve` command to find the critical numbers? Why? Mathematica may freak out, and you may need to restart it.
- (b) The problem lies with the `Solve` command. Instead, try the following: from the graph, estimate the critical numbers and then use the `FindRoot` command to find each of the critical numbers.

5. For each continuous function given below, find the absolute maximum and minimum of the function on the given closed interval.

(a) $f(x) = x^{\frac{4}{5}}(x - 4)^3$, $2 \leq x \leq 6$

(b) $g(t) = \frac{12t^5 + 15t^4 - 260t^3 - 30t^2 + 720t}{60}$ on $[-6, 4]$.