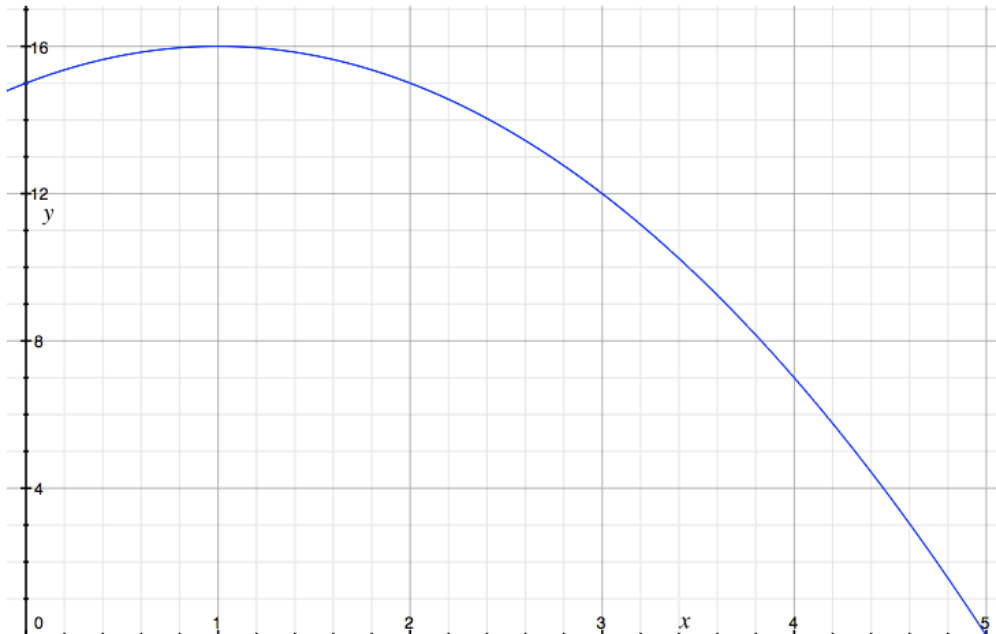


4.1 Maxima and Minima

Example A

A ball is thrown vertically. We assume that the height of the ball at time t is given by the function $h(t) = -x^2 + 2x + 15$.

1) Using the graph of the function h , state where the ball reaches its highest point and at what time the ball reaches this point.



2) What is the derivative of h ?

3) Solve the equation $h'(x) = 0$. Let us call y the point such that $h'(y) = 0$.

4) What is the value of $h(y)$?

Example B

Let $g(x) = \frac{1}{2}x^3 + x^2 + 1$

1) Solve $g'(x) = 0$. Let y_1 and y_2 be the points such that $g'(y_1) = g'(y_2) = 0$.

2) Are y_1 and y_2 global extrema of g ?

3) Are y_1 and y_2 local extrema of g ?

4) What is the global maximum of g ? Let us denote y_3 the point where g reaches its maximum.

5) What is the value of y_3 ?

6) What is the value of $g'(y_3)$?

Procedure for locating extreme values on a closed interval

Assume that the function f is continuous on $[a, b]$?

1. Locate the critical points of f that is, the points $c \in (a, b)$ where $f'(c) = 0$ or $f'(c)$ does not exist.
2. Evaluate f at a , b and at all the critical points.
3. Choose the largest and smallest values of step 2.