Example of finding the maximum number in a function, vector, or array

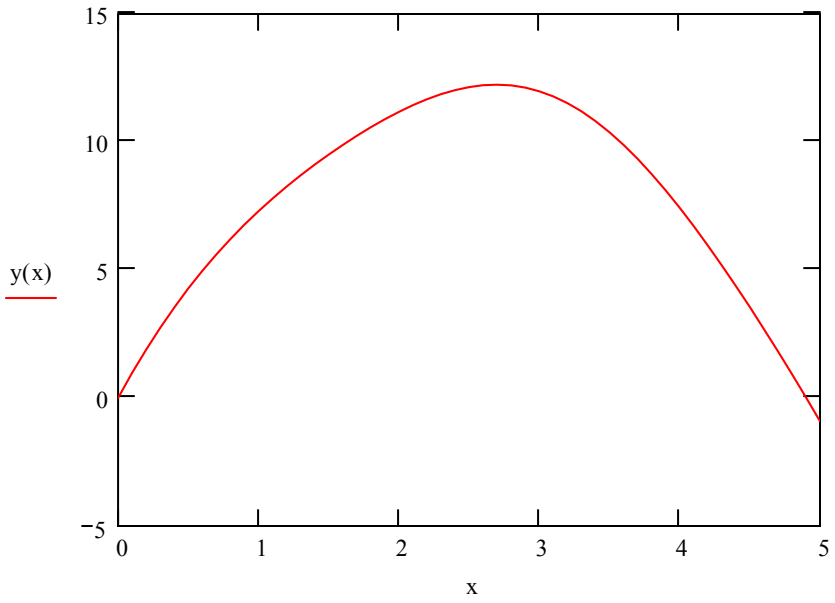
range variables don't work for this:

$x := 0, 0.1 .. 5$ this is a range variable, where x varies from 0 to 5 in increments of 0.1. There are 50 points total.

$y(x) := 10x - \sin(x)^2 - 2 \cdot x^2$ this is the function definition

x =	y(x) =	max(y(x)) =
0	0	0
0.1	0.97	0.97
0.2	1.881	1.881
0.3	2.733	2.733
0.4	3.528	3.528
0.5	4.27	4.27
0.6	4.961	4.961
0.7	5.605	5.605

max() doesn't work here because y must be a vector or an array. Here, y(x) is a function evaluated over the values of a range variable (useful mostly for plotting).



from the plot, the maximum should be between 12 and 13 and occur close to 3.

Here's one solution ... using vectors to store both x and y:

$i := 0 .. 50$

$xv_i := \frac{i}{50} \cdot 5$

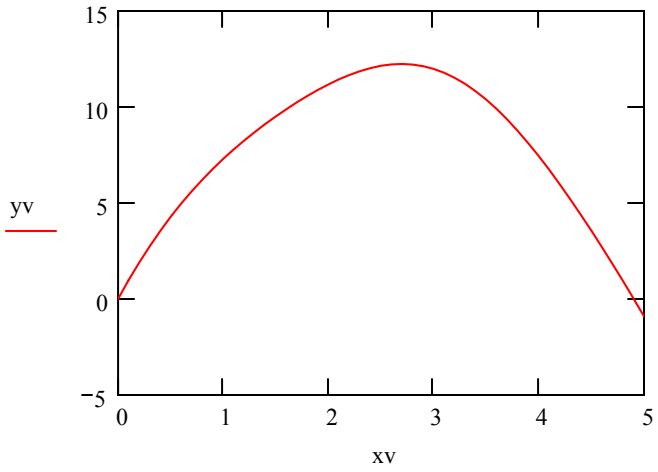
$yv_i := y(xv_i)$

$xv =$

	0
0	0
1	0.1
2	0.2
3	0.3
4	0.4
5	0.5
6	0.6
7	0.7
8	0.8
9	0.9

$yv =$

	0
0	0
1	0.97
2	1.881
3	2.733
4	3.528
5	4.27
6	4.961
7	5.605
8	6.205
9	6.766



$y_{max} := \max(yv)$ $y_{max} = 12.237$

$\text{lookup}(y_{max}, yv, xv) = (2.7)$

Here's a more elegant solution:

$x := 3$ initial guess

$x := \text{maximize}(y, x)$

$x = 2.695$

$y(x) = 12.237$