

Classes 12. Wolfram Alpha program: Visualization and Manipulation. Programming elements.

<http://reference.wolfram.com/language/ref/Manipulate.html>

Exercise 1. Introduce in the WolframAlpha: manipulate x in $x^2 + y^2$ (Fig. 1):

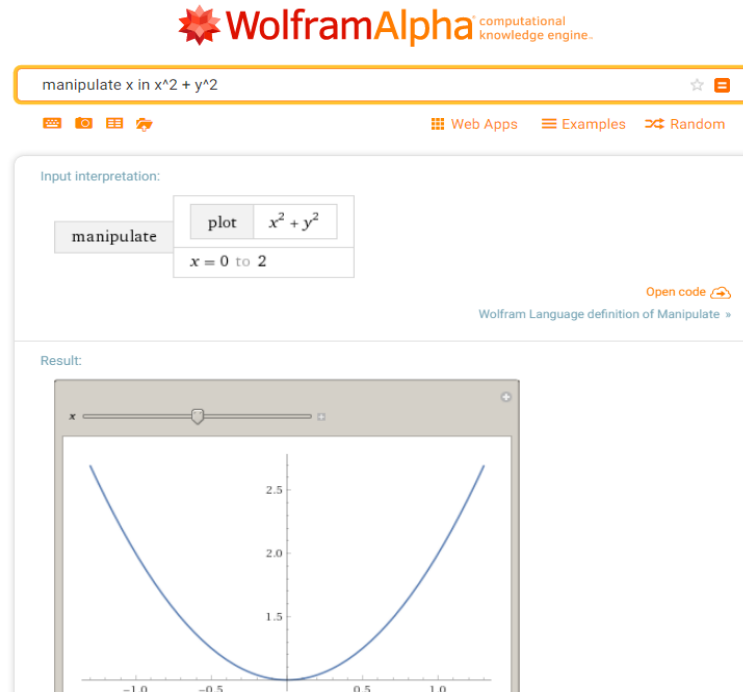


Figure 1.

Explain this example, namely:

- What does the variable x mean?
- Which range does x belong to?
- Visualization of which curve is shown in Figure 1?

Exercise 2. Enter in WolframAlpha: manipulate $nx + y^2$:

- Draw a graph;
- Explain this example (what do the symbols n , x mean)?

Which interval is for x , y ?

Visualization of which surface is drawn?

Exercise 3. Click on the area (Fig. 1) "Wolfram Language definition of Manipulate".

Consider the following examples:

- 1) Basic examples;
- 2) Applications;
- 3) Neat Examples.

Programming elements

Strings

String is the head of a character string "text".

Strings can contain any sequence of ordinary or special characters.

Mathematica offers many functions that operate on strings. We will discuss some of them.

StringJoin[s_1, s_2, \dots] or StringJoin[{ s_1, s_2, \dots }] or $s_1 \langle \rangle s_2 \langle \rangle \dots$ yields a string consisting of a concatenation of the s_i .

StringLength["string"] gives the number of characters in a string.

StringPosition["string", "sub"] gives a list of the starting and ending character positions at which "sub" appears as a substring of "string".

StringPosition["string", patt] gives all positions at which substrings matching the general string expression patt appear in "string".

StringPosition["string", patt, n] includes only the first n occurrences of patt.

StringPosition[{ s_1, s_2, \dots }, p] gives the list of results for each of the s_i .

StringTake["string", n] gives a string containing the first n characters in "string".

StringTake["string", -n] gives the last n characters in "string".

StringTake["string", {n}] gives the n^{th} character in "string".

StringTake["string", {m, n}] gives characters m through n in "string".

Sort[{ s_1, s_2, \dots }] sorts the elements s_1, s_2, \dots

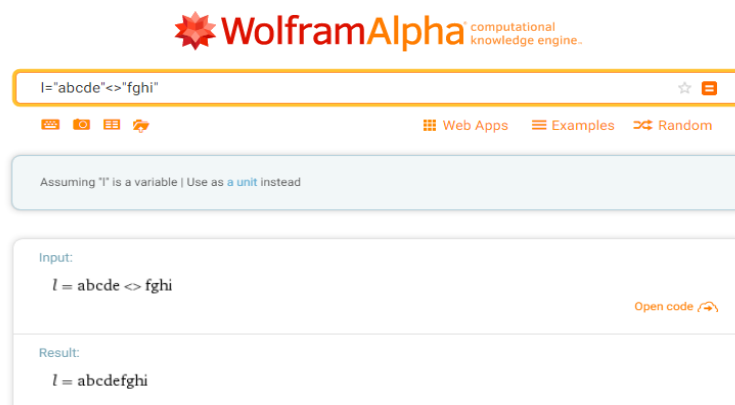
ToUpperCase[string] yields a string in which all letters have been converted to uppercase.

ToLowerCase[string] yields a string in which all letters have been converted to lowercase.

ToString[expr] gives a string corresponding to the printed form of expr in OutputForm.

ToExpression[input] gives the expression obtained by interpreting strings or boxes as Wolfram Language input.

Example.



The screenshot shows the WolframAlpha interface. At the top, the logo "WolframAlpha" is displayed with the tagline "computational knowledge engine." Below the logo is a search bar containing the input `l="abcde"<>"fg"`. To the right of the search bar are icons for a star and a document. Below the search bar are navigation links: "Web Apps", "Examples", and "Random". A light blue banner below the search bar contains the text "Assuming 'l' is a variable | Use as a unit instead". The main content area is divided into two sections: "Input:" and "Result:". The "Input:" section shows the code `l = abcde <> fg` and an "Open code" link. The "Result:" section shows the output `l = abcdefg`.

Exercise 4. We have a string “abbaabbaa”.

What transformation needs to be done to get a string ”XbaXbaa”?

Exercise 5. Find the domain of functions:

a) $f(x) = x/(x - 1)$;

b) $f(y) = \operatorname{tg} y$;

c) $f(z) = (1 - z)^{\frac{1}{2}}$.

Exercise 6. Find the range of functions:

a) $f(x) = e^{(-\frac{1}{4} x)}$;

b) $f(x) = (\sin x)^2$;

c) $f(y) = y/(y^2 + 1)$.

Special functions

Exercise 7. Calculate the derivative of Airy's function and draw its graph. Find the value of the function at the point $x = 1$.

Exercise 8. Calculate the integral of the BesselJ function ($n = 3$) and draw its graph. Find the value of the BesselJ function ($n = 3$) at the point $x = 2$.