Classes 2. WolframAlpha Basics

http : // www.wolframalpha.com/tour/what - is - wolframalpha.html

Wolfram|Alpha is an engine for computing answers and providing knowledge.

It works by using its vast store of expert-level knowledge and algorithms to automatically answer questions, do analysis, and generate reports.

It gives you access to the world’s facts and data and calculates answers across a range of topics, including science, nutrition, history, geography, engineering, mathematics, linguistics, sports, finance, music.

Basic operations:
Addition: a + b
Subtraction: a-b
Multiplication: a * b
Division: a / b
Raising to a power: a^ b

- **Exercises 1.1**

Find value:
214+178,
214-178,
214 *178,
214 ^178;
(a^ 2 + b ^ 2) - (a ^ 2-b ^ 2);
(a^ 3 + b ^ 3)*(a ^ 3-b ^ 3);
(a - b) ^ (3-1/ 2).

- **Signs of comparison**

Less than: <
More: >
Equal to: = lub ==
Less than or equal to: <=
Greater than or equal to: > =

Logical symbols
And: &&
OR: | |
No: !

Fundamental Mathematical Constants
Number π: Pi
Number e: E
Infinity: Infinity or inf

Mathematical Functions:
x^a: X ^a
$\sqrt{x}$: Sqrt [x]
$\sqrt[n]{x}$: X ^ (1 / n)

a^x: a ^ X
$\log_a x$: Log[a,x]
ln x: Log[x]
cos x: cos [x] lub Cos [x]
sin x: sin [x] lub Sin [x]
tg x: tan [x] lub Tan [x]
ctg x: cot [x] lub Cot[x]
arccos x: ArcCos[x]
arcsin x: Arcsin [x]
arctg x: Arctan [x]
arcctg: ArcCot [x]
ch x: cosh [x] lub Cosh [x]
sh x: sinh [x] lub Sinh [x]
th x: tanh [x] lub Tanh [x]
areach x: ArcCosh [x]
areash x: ArcSinh [x]
areath x: ArcTanh [x]

- **Solution of equations**

To obtain the solution of the equation of form $f(x) = 0$ write in Wolfram | Alpha:
f [x] = 0,
and we will get some additional information that is generated automatically. If you only want a solution, you need to enter: **Solve**[f [x] = 0, x].

Examples 1.2
Find a solution*:*
Solve[Sin[x]-Sin[2x] + Cos [3x] = 0, x] or
Sin[x] - Sin[2x] + Cos [3x] = 0;

Solve[x ^ 6 - x ^ 4 + x^2 -1 = 0, x] or
x ^ 6 - x ^ 4 + x^2 -1 = 0;

Solve[Log[2, x ^ 2 +4 x+4]-Log [4, x] = 0, x] or
Log[2, x ^ 2 +4 x+4]-Log [4, x] = 0

If the equation contains several variables, then it can be written as f [x, y, ..., z] = 0, we can try to solve this equation with respect to any of these variables.
Solve[f [x, y, ..., z] = 0, *i*], where *i* - is one of the variables.

Examples 1.3
Find a solution*:*
Sin [x - y] = 0 or Solve[Sin[x - y] = 0, x] or
Solve [Sin [x - y] = 0, y];

x ^ 2 - y ^ 2+4 = 0 or Solve [x ^ 2 - y ^ 2+4 = 0, x] or
Solve [x ^ 2 - y ^2+4 = 0, y];

x1 + y1 + z1 +x2 + y2 + z2 = 25.

Solution of inequality

Solution of inequality with Wolfram Alpha it is analogous to solving the equation. You need to write in WolframAlpha:
f [x]> 0 or f [x]> = 0 or
Solve [f [x]> 0, x] or Solve [f [x]> = 0, x].

Examples 1.4
Solve inequalities*:*
Cos [4x] -$\sqrt{3}\Big/$2> 0 or Solve [Cos [4x] -$\sqrt{3}$ / 2> 0, x];

4 x ^ 2- 12 x +9> = 0 or Solve [4 x ^ 2- 12 x +9> = 0, x].

Let the inequality contains several variables and has the form:
f [x, y, ..., z]> 0 or f [x, y, ..., z]> = 0.
For the solution of this inequality with respect to one of the variables you need to write the command:
Solve[f [x, y, ..., z]> 0, *i*] or Solve [f [x, y, ..., z]> = 0 ,*i*],
where *i* is one of the variables.

Examples 1.5
Solve inequalities*:*
Cos [x + y]> 0 and Solve [Cos [x + y]> 0, x] and
Solve [Cos [x + y]> 0, y];

x ^ 2 + y ^ 2/3 <0 or solving [x ^ 2 + y ^ 2/3 <0, x] i
Solve [x ^ 2 + y ^ 2/3 <0, y];
x + y + z> = 12.

Solution of different systems of equations and inequalities.

Solution of different types of systems in Wolfram Alpha is very simple. You write equations and inequalities as described above, combining them with word “and”, which in Wolfram Alpha is marked as a symbol &&.

Examples 1.6
Solve systems of equations:
x ^ 4 + y ^4 == 16 && x -2 y =4;
x + 2y +3 z +4 p == 10 && x +3 y-4z +7 p = 7 && x -2 y p = -1;
Sin [2x- y] + Cos [2x - y] == 1 / 2 && 2x - y ^{2} = -1/2;
Log [x -3] = 0 && 2 x + y +5 z <8.

Graphs of functions

Wolfram Alpha allows to plot functions of one *f* (*x*) and two variables *f(x,y)*. To construct a graph of the function *f(x)* in the interval $x\in$[a,b] we should write in Wolfram Alpha:
Plot[f [x], {x, a, b}].
If we want to change the scope of a variable *y*, for example, $y\in$[c,d] we should write:
Plot[f [x], {x, a, b}, {y, c, d}].

Examples 1.7
Draw graphs:
Plot[x ^ 4 -2 *x*^2-5, {x, -2, 2}];

Plot [x ^ 4 -2 *x*^2-5, {x, -2, 2}, {y, -3,8}];
Plot [Cos [x] ^ x, {x,-E, 2Pi}];
Plot [Cos [x] ^ x, {x,-E, 2Pi}, {y, -1,1}].

If you need to build multiple graphs on one drawing, you can display them using "and":
Plot [f [x] && g [x] && ... && h [x], {x, a, b}] .

Examples
Plot [2x-1 && (x+1) ^ 2 && x^4, {x, -1,1}, {y, -2, 5}];
Plot [Cos [x] && Cos[2x] && Cos[3x], {x, -2 Pi, 2 Pi}].

To construct a function graph on a rectangle, you need to write:
Plot[f [x, y], {x, a, b}, {y, c, d}].
Unfortunately, the range *z*=f[x,y] can not be changed now. However, it is worth noting that we will receive not only the surface that we define, but also a "contour map" of the surface (linear level).

Examples 1.8
Draw graphs:
Plot [Tan [x ^ 2 + y ^ 2], {x, -Pi, Pi}, {y, -4,4}];
Plot [2xy, {x, -3,3}, {y, -3,3}].