# Week 7 - Symbolic Calculus

Using Sage we can carry out various operations from Calculus. This week we will investigate how to:

* Carry out limits in Sage;
* Carry out differentiation in Sage;
* Carry out integration in Sage.

1. Last week we saw how to define a function in Sage:

* f(x) = x ^ 3 + 3 \* x + sin(x)
* To obtain the variables of a function we can use the variables method:
* print f.variables()
* Try this with a function of more than one variable:
* f(x, y) = x \* y + x ^ 2 + y ^ 2

1. In calculus the following definition of a limit is well know:

* iff such that : .

1. Two sides limits
2. Algebra of limits
3. Basic differentiation
4. Limiting definition of a derivative
5. Plotting the limiting definition of a derivative
6. Visualising the limiting definition of a derivative
7. Differentiation rules
8. Basic integration
9. Integration by parts
10. Riemann integration
11. Numerical integration
12. Integrate polynomials in a data file