

Math 1062, Spring 2012, Homework 4

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- You are encouraged to work with other people on homework; thank them explicitly in your write up.
- You can find the L^AT_EX of this file at <http://wstein.org/edu/2012/1062/hw/>.
- I will have office hours 11am–2pm in Padelford C423 on Thursdays. You can email me at wstein@gmail.com or the list at uw-sage-2012@googlegroups.com for help. I will often cc a sanitized version of my answer to the list, so everybody benefits.
- Your solution will be a Sage worksheet, which will likely have many cells that start with `%cython`. Note that `%cython` might not work if you have installed Sage on your own computer but don't have a compiler installed—it will definitely work on <http://480.sagenb.org>.

1 Homework

There are 3 problems.

1. Write functions called `sum_python` and `sum_cython` in Python and Cython to compute the sum of the squares of the first n integers, using a naive algorithm (don't use a formula). Thus `sum_python(106)` will output `333333833333500000`. You may assume $n \leq 10^6$. Make sure the Cython program explicitly declares the types of the variables that it uses. Compare how fast the two functions are when given $n = 10^6$ as input (be carefully not to get confused by the units output by `timeit`).
2. Show how to use Sage to find a closed form expression for $\sum_{k=1}^n \cos(k)$. [Hint: use the `sum` command.]
3. In homework assignment 2 you wrote 8 functions, called `fa`, `fb`, ..., `fh`. For each of those functions, put them unchanged into a Sage worksheet with `%cython` at the top of the cell. Using `timeit` and input of your choice, compare the timings of the original Python versions of these functions with the Cython version. You may want to change some of the functions to account for the fact that Cython code is not precompiled; you may also want to do `from sage.all import functions, you, need`. [Last sentence updated from when I originally assigned this.]