

PIC 16, Winter 2018– Preparation 9M

Assigned 2/28/2018. To be completed by class 3/5/2018.

Intended Learning Outcomes

By the end of this preparatory assignment, students should be able to:

- calculate definite integrals and solve systems of ODEs using `scipy.integrate`, and
- perform basic image processing operations using `scipy.ndimage`.

Tasks

- ☐ If you haven't seen differential equations before, check out [this](#).
- ☐ If you are not familiar with Euler's method or other numerical methods for solving differential equations, watch [this](#).
- ☐ If you don't know how higher order differential equations (ODEs) are reduced to systems of first-order differential equations, see [this](#).
- ☐ You can also check out the first half of the [Track A Math Review \(Part II\)](#) for more on ODEs.
- ☐ Follow [1.5.7 of the SciPy Lectures](#).
 - Try evaluating $\int_0^4 x^x dx$ using sympy. It won't give you a real answer.
 - Do it with SciPy. Yeah, so now you can integrate pretty much anything. Numerically, anyway, which means that the results are approximate. Fortunately, the second output of the `quad` function (only provided when `full_output` is explicitly set `True`) is an estimate of the absolute error.
 - The assignment will be to solve a more involved ODE, so please do follow the ODE examples carefully, and especially the second one, as it is important to be able to write higher order equations as systems of first-order equations.
- ☐ (Optional) Follow 1.5.9 if you're interested.
- ☐ Follow 1.5.10.1.
- ☐ (Optional) Follow the rest of 1.5.10 if you're interested.