MA 16010 Lesson 28: Antiderivatives II

A **differential equation** (in x and y) is an equation relating $x, y = y(x)$, and the derivatives $y', y'', \ldots$

Examples:

      1) $y' = 3x + 5,$

      2) $2\cos(x) + y'' = 1,$

      3) $3x^2 y' - 2xy = x^{3/2}$ (more complicated – Calc 2), $\ldots$

Exercise: Find the general solution to the equations 1) and 2) above.

To pinpoint one particular solution, one can specify an additional value of y (and y' for example) at a point. This is called an **initial value problem.**

To solve them:

Exercise: Solve the initial value problem

$$y' = 5 - 4x, \quad y(2) = 5$$

Exercise: Given that $y = y(x)$ satisfies

$$y'' = 3e^x - 2, \quad y'(0) = 4, \quad y(0) = 8,$$

find $y(2)$.

Exercise: The rate of change $\mathrm{d}P/\mathrm{d}t$ of a population of rabbits is proportional to the square root of t with proportionality constant 4, where P is the population size and t is the time that passed from the present moment (in months). If the initial size of the population is 500, find the (approximate) population after 5 months.