

MA 16020 Lesson 7: Separation of variables II

Recap: A differential equation is called *separable* if it can be brought to the form:

Then we proceed to solve the equation as follows:

Exercise 1. Find a general solution to the equation

$$\frac{dy}{dx} = 4x^3(3 - y),$$

then find a particular solution satisfying $y(0) = 5$.

Exercise 2. Find a general solution to the equation

$$\frac{dy}{dx} = \frac{2x^3 + 3}{6y^2}.$$

Exercise 3. Find a particular solution to the equation

$$\frac{dy}{dx} = 3e^{3t-2y}$$

such that $y = 0$ when $t = 0$.

Exercise 4. A wet sweater drying in the sun loses its moisture at a rate proportional to its moisture content. After 1 hour, the sweater lost 32% of its original moisture content. How long will it take for the sweater to lose 75% of its original moisture content?

Exercise 5. A newly created ceramic pot has an initial temperature $1547^\circ F$. Upon placing it into a room with constant temperature $72^\circ F$, after one hour the temperature of the pot is $922^\circ F$. What is the temperature of the pot after 5 hours?
(Recall *Newton's law of cooling*:)