1 曲線群と微分方程式
Family of curves and differential equation

1.1

Let a be an arbitrary constant. Follow the steps below to derive an ordinary differential equation whose general solution is the family of curves; $y = ax^{-1} + ax$.

1. Describe the family of curves in xy-plane when the constant a changes.
2. Express the constant a with the variables x, y and y'.
3. What is the differential equation that the function y satisfies.

1.2 pp. 4-5

Find the ordinary differential equation through eliminating the arbitrary constants a, b from the following family of curves;

$$y = \frac{a}{x} + bx.$$

1.3 p.9

Consider a differential equation as follows,

$$2y\frac{dy}{dx} = 3x^2 + 2. \qquad (*)$$

(a)Find a general solution of the above differential equation $(*)$.
(b)Eliminate an arbitrary constant in the solution obtained in (a).
(c)Verify whether the solution derived in (a) satisfys the differential equation $(*)$.