

Section 1: Introduction

Exercise level 2

1. Find the general solutions of each of the following differential equations by separating the variables. Give y in terms of x .

(i) $\frac{dy}{dx} = x^2y + 2y$

(ii) $x\frac{dy}{dx} = \cos^2 y$

(iii) $\frac{dy}{dx} = xe^{x+y}$

(iv) $\frac{dy}{dx} = x(1 - y^2)$

(v) $\frac{dy}{dx} = \frac{2y}{x(x-2)}$

2. (i) Find the general solution of the differential equation $x\frac{dy}{dx} = y + 1$.

(ii) Sketch several members of the family of solution curves.

(iii) Find the particular solution in the case where $y = 1$ when $x = 1$.

3. (i) Find the general solution of the differential equation $\frac{dy}{dx} = y$.

(ii) Sketch several members of the family of solution curves.

(iii) Find the particular solution in the case where $y = 2$ when $x = 1$.

4. (i) Find the general solution of the differential equation $\frac{dy}{dx} = y^2$.

(ii) Sketch several members of the family of solution curves.

(iii) Find the particular solution in the case where $y = 2$ when $x = 0$.