Section 1: Introduction

Solutions to Exercise level 1

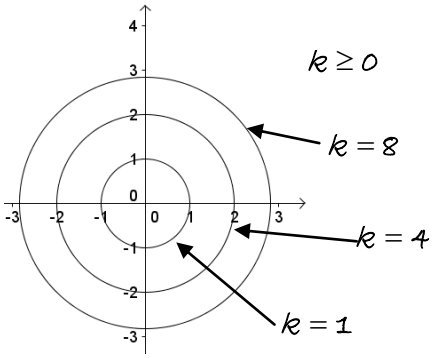
1. (i) $\frac{dy}{dx} = -\frac{x}{y}$

$\int y\,dy = \int -x\,dx$

$\frac{y^2}{2} = -\frac{x^2}{2} + c$

$y^2 = -x^2 + k$

$x^2 + y^2 = k$



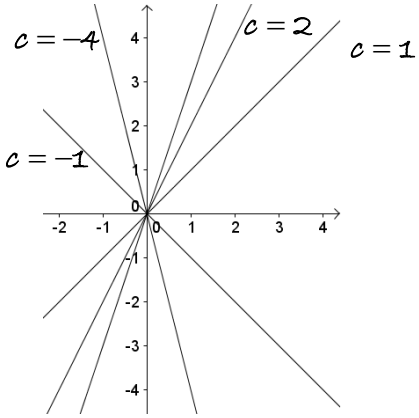
(ii) $\frac{dy}{dx} = \frac{y}{x}$

$\int \frac{1}{y}\,dy = \int \frac{1}{x}\,dx$

$\ln y = \ln x + \ln c$

$\ln y = \ln cx$

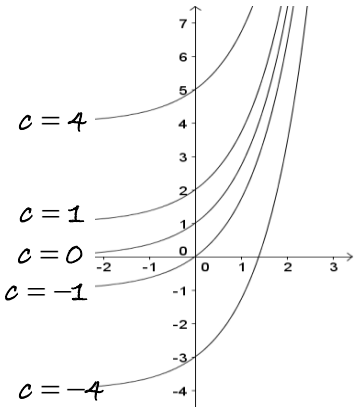
$y = cx$



(iii) $\frac{dy}{dx} = e^x$

$\int 1\,dy = \int e^x dx$

$y = e^x + c$

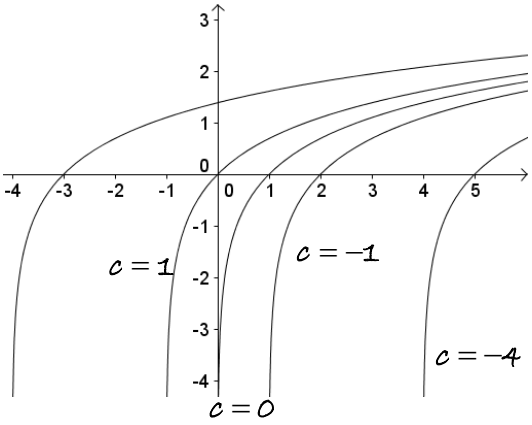


(iv) $\frac{dy}{dx} = e^{-y}$

$\int e^y dy = \int 1\,dx$

$e^y = x + c$

$y = \ln(x + c)$



Edexcel FM First order DEs 1 Exercise solutions

2. (i) $\frac{dy}{dx} = \frac{\sqrt{x}}{2y}$

$\int 2y\,dy = \int \sqrt{x}\,dx$

$y^2 = \frac{2}{3}x^{\frac{3}{2}} + c$

(ii) When $x = 1$, $y = 0$

$0 = \frac{2}{3} + c \quad \Rightarrow c = -\frac{2}{3}$

Particular solution is $y^2 = \frac{2}{3}x^{\frac{3}{2}} - \frac{2}{3}$

3. (i) $\frac{dx}{dt} = \frac{8}{x}$

$\int x\,dx = \int 8\,dt$

$\frac{x^2}{2} = 8t + c$

$x^2 = 16t + k$

(ii) When $t = 1$, $x = 3$

$9 = 16 + k$

$k = -7$

$x^2 = 16t - 7$

(iii)