

8 The variables x and y satisfy the differential equation

$$(x^2 + 1) \frac{dy}{dx} = kxe^{2y},$$

where k is a constant. It is given that $y = 0$ when $x = 0$ and that $y = -\frac{1}{2}$ when $x = 1$.

Solve the differential equation and find the exact value of y when $x = \sqrt{3}$. [8]

①

2

- [3]

This image shows a full page of white paper with horizontal dashed lines, typical of primary-ruled notebook paper. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

- $$\frac{dy}{dx} = \frac{x^3 + 5x^2 - 2x - 15}{6y(x^2 - 3)}.$$

Solve the differential equation to obtain an expression for y^2 in terms of x . [5]

[illegible][illegible]

8 The variables x and θ satisfy the differential equation

$$\sin 2\theta \frac{dx}{d\theta} = (4x+3)\cos 2\theta,$$

and $x = 0$ when $\theta = \frac{1}{12}\pi$.

Solve the differential equation and obtain an expression for x in terms of θ .

[7]