

Practice for assessment: Methods in Algebra and Calculus
Methods in Algebra and Calculus Standard 1.4

1. Find the general solutions to the differential equations:

a. $3y = (x + 1) \frac{dy}{dx}$

b. $\frac{dy}{dx} = y \sin x$

c. $\frac{dy}{dx} = x \sec y$

4 marks each

2. Find the general solution to the following first order linear differential equations giving your answer in the form $y = f(x)$:

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

b. $\frac{dy}{dx} + \frac{1}{x^2}y = x^4 e^{1/x}$

c. $x \frac{dy}{dx} - 2y = 6x^4$

(4,5,5)

3. Find the particular solutions to the following second order differential equations:

a. $\frac{d^2y}{dx^2} - 4 \frac{dy}{dx} - 12y = 0$, when $x = 0$, $y = 4$ and $\frac{dy}{dx} = 0$

b. $\frac{d^2y}{dx^2} + 6 \frac{dy}{dx} + 9y = 0$, when $x = 0$, $y = 1/2$ and $\frac{dy}{dx} = -1/2$

6 marks each

4. Find the general solution to the equation $\frac{d^2y}{dx^2} + \frac{dy}{dx} + 2y = 0$

(4)