

Advanced Higher Mathematics - Methods in Algebra and Calculus
Unit Assessment Preparation - Further Practice Questions

Methods in Algebra and Calculus Assessment Standard 1.4

1. Find the general solution of the differential equations

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

(b) $\frac{dy}{dx} = \frac{5y}{x^2}$

(c) $\frac{dy}{dx} = \frac{y}{x+1}$

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

(e) $\frac{dy}{dx} = 6xy$

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

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

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

2. Find the general solution in the form $y = f(x)$ of the first order linear differential equations:

(a) $x^2 \frac{dy}{dx} - xy = 4$

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

(c) $x \frac{dy}{dx} + y = \sin x$

(d) $x \frac{dy}{dx} + 2y = \frac{4}{x}$

(e) $x \frac{dy}{dx} - 2y = 6x^4$

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

(g) $3x \frac{dy}{dx} + 3y = 2x$

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

Answers:

1 (a) $y = \frac{Ax}{2}$

(b) $y = \frac{A}{5e^{\frac{1}{x}}}$

(c) $A(x+1)$

(d) $Ax - 2$

(e) Ae^{3x^2}

(f) $Ae^{\frac{2}{3}x^3}$

(g) $Ae^{\frac{3}{2}x^2} - 1$

(h) $Ae^{\frac{1}{3}x^3} + 1$

2 (a) $y = -\frac{2}{x} + Cx$

(b) $y = \frac{1}{3}x^2 + \frac{C}{x}$

(c) $y = \frac{C - \cos x}{x}$

(d) $y = \frac{4}{x} + \frac{C}{x^2}$

(e) $y = 3x^4 + Cx^2$

(f) $y = \frac{1}{3}e^x + \frac{C}{e^{\frac{1}{2}x}}$

(g) $y = \frac{1}{3}x + \frac{C}{x}$

(h) $y = -x + Cx^2$