

Section 1: Introduction to integration

Solutions to Exercise level 1

1. (i)  $\int(2x+3)dx = x^2 + 3x + c$

(ii)  $\int(x^2 - 4x - 1)dx = \frac{1}{3}x^3 - 2x^2 - x + c$

(iii)  $\int(x^5 + 1)dx = \frac{1}{6}x^6 + x + c$

(iv)  $\int(x^3 + 2x - 7)dx = \frac{1}{4}x^4 + x^2 - 7x + c$

2. (i)  $\frac{dy}{dx} = 3x^2 - 4$   
 $y = 3 \times \frac{1}{3}x^3 - 4x + c$   
 $= x^3 - 4x + c$

(ii) When  $x = 2, y = -1$   
 $-1 = 2^3 - 4 \times 2 + c$   
 $-1 = 8 - 8 + c$   
 $c = -1$   
 Equation of curve is  $y = x^3 - 4x - 1$

(iii) When  $x = 1, y = 1^3 - 4 \times 1 - 1 = 1 - 4 - 1 = -4$   
 so the curve passes through the point  $(1, -4)$ .

3.  $\frac{dy}{dx} = 4x - x^2$   
 $y = 4 \times \frac{1}{2}x^2 - \frac{1}{3}x^3 + c$   
 $= 2x^2 - \frac{1}{3}x^3 + c$   
 When  $x = 3, y = 2$   
 $2 = 2 \times 3^2 - \frac{1}{3} \times 3^3 + c$   
 $2 = 18 - 9 + c$   
 $c = 2 - 18 + 9 = -7$   
 $y = 2x^2 - \frac{1}{3}x^3 - 7$

## Edexcel AS Maths Integration 1 Exercise solutions

4.  $\frac{dh}{dt} = 25 - 10t$

$$h = 25t - 5t^2 + c$$

$$\text{When } t = 0, h = 30 \Rightarrow 30 = c$$

$$h = 25t - 5t^2 + 30$$

$$\text{When } h = 0, 25t - 5t^2 + 30 = 0$$

$$5t - t^2 + 6 = 0$$

$$t^2 - 5t - 6 = 0$$

$$(t - 6)(t + 1) = 0$$

$$t = 6 \text{ or } t = -1$$

Since  $t$  must be positive, the value of  $t$  must be 6.

5.  $\frac{dy}{dx} = (x+1)^2 = x^2 + 2x + 1$

$$y = \frac{1}{3}x^3 + x^2 + x + c$$

$$\text{When } x = 2, y = 0$$

$$0 = \frac{1}{3} \times 2^3 + 2^2 + 2 + c$$

$$0 = \frac{8}{3} + 4 + 2 + c$$

$$c = -\frac{26}{3}$$

$$y = \frac{1}{3}x^3 + x^2 + x - \frac{26}{3}$$