

Section 1: Finding areas

Solutions to Exercise level 1

1. (i) $(0, 3)$

(ii) $y = \sqrt{9 - 4x}$

$y^2 = 9 - 4x$

$4x = 9 - y^2$

$x = \frac{9 - y^2}{4}$

$$\begin{aligned}
 \text{(iii) Area} &= \int_0^3 x \, dy \\
 &= \int_0^3 \left(\frac{9 - y^2}{4} \right) dy \\
 &= \left[\frac{9}{4}y - \frac{y^3}{12} \right]_0^3 \\
 &= \frac{27}{4} - \frac{27}{12} - 0 = \frac{9}{2}
 \end{aligned}$$

2. (i) $x^2 - 3x + 1 = 5$

$x^2 - 3x - 4 = 0$

$(x + 1)(x - 4) = 0$

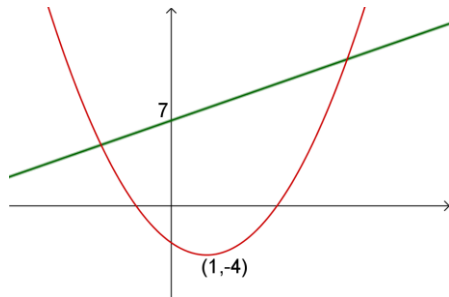
$x = -1 \text{ or } 4$

Points of intersection are $(-1, 5)$ and $(4, 5)$

$$\begin{aligned}
 \text{(ii) Area} &= \int_{-1}^4 (5 - (x^2 - 3x + 1)) \, dx \\
 &= \int_{-1}^4 (4 - x^2 + 3x) \, dx \\
 &= \left[4x - \frac{1}{3}x^3 + \frac{3}{2}x^2 \right]_{-1}^4 \\
 &= 16 - \frac{64}{3} + 24 - \left(-4 + \frac{1}{3} + \frac{3}{2} \right) \\
 &= \frac{125}{6} = 20 \frac{5}{6}
 \end{aligned}$$

Edexcel A level Maths Integration 1 Exercise solutions

3. (i)



(ii) For intersections, $x + 7 = (x - 1)^2 - 4$
 $\Rightarrow x^2 - 3x - 10 = 0$
 $\Rightarrow (x - 5)(x + 2) = 0$
so the intersections are at $(-2, 5)$ and $(5, 12)$.

$$\begin{aligned} \text{(iii) Area} &= \int_{-2}^5 (x + 7 - (x^2 - 2x - 3)) dx \\ &= \int_{-2}^5 (-x^2 + 3x + 10) dx \\ &= \left[-\frac{1}{3}x^3 + \frac{3}{2}x^2 + 10x \right]_{-2}^5 \\ &= -\frac{125}{3} + \frac{75}{2} + 50 - \left(\frac{8}{3} + 6 - 20 \right) \\ &= \frac{343}{6} = 57 \frac{1}{6} \end{aligned}$$

4. (i) At points of intersection, $x^2 - 5x + 2 = -x^2 + x + 2$

$$2x^2 - 6x = 0$$

$$x^2 - 3x = 0$$

$$x(x - 3) = 0$$

The points of intersection are $(0, 2)$ and $(3, -4)$

$$\begin{aligned} \text{(ii) Area} &= \int_0^3 (-x^2 + x + 2 - (x^2 - 5x + 2)) dx \\ &= \int_0^3 (-2x^2 + 6x) dx \\ &= \left[-\frac{2}{3}x^3 + 3x^2 \right]_0^3 \\ &= -18 + 27 - 0 \\ &= 9 \end{aligned}$$