1 **(i)** Express $x^2 - 5x + 6$ in the form $(x - a)^2 - b$. Hence state the coordinates of the turning point of the curve $y = x^2 - 5x + 6$. **[4]**

(ii) Find the coordinates of the intersections of the curve $y = x^2 - 5x + 6$ with the axes and sketch this curve. **[4]**

(iii) Solve the simultaneous equations $y = x^2 - 5x + 6$ and $x + y = 2$. Hence show that the line $x + y = 2$ is a tangent to the curve $y = x^2 - 5x + 6$ at one of the points where the curve intersects the axes. **[4]**

2

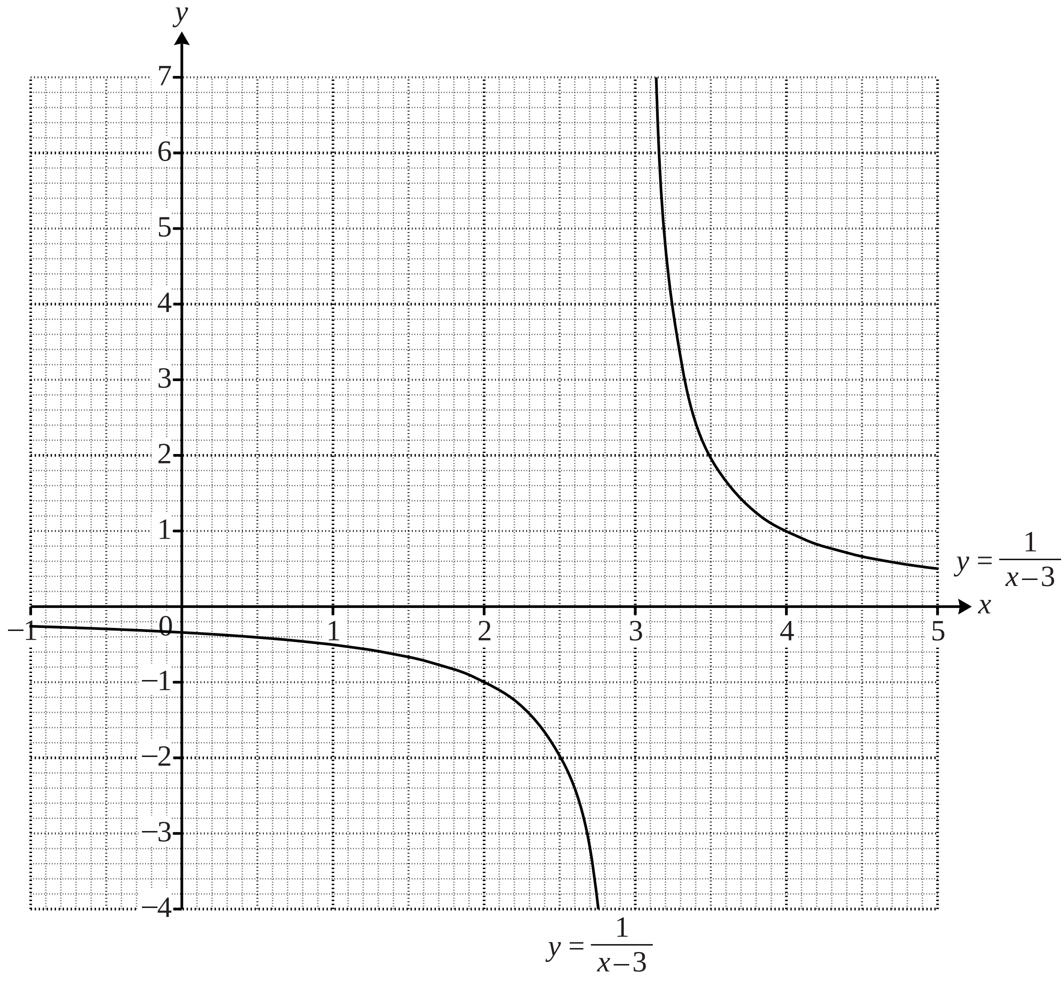

Fig. 12

Fig. 12 shows the graph of $y = \dfrac{1}{x-3}$.

(i) Draw accurately, on the copy of Fig. 12, the graph of $y = x^2 - 4x + 1$ for $-1 \leqslant x \leqslant 5$. Use your graph to estimate the coordinates of the intersections of $y = \dfrac{1}{x-3}$ and $y = x^2 - 4x + 1$. **[5]**

(ii) Show algebraically that, where the curves intersect, $x^3 - 7x^2 + 13x - 4 = 0$. **[3]**

(iii) Use the fact that $x = 4$ is a root of $x^3 - 7x^2 + 13x - 4 = 0$ to find a quadratic factor of $x^3 - 7x^2 + 13x - 4$. Hence find the exact values of the other two roots of this equation. **[5]**

3 **(i)** Find algebraically the coordinates of the points of intersection of the curve $y = 4x^2 + 24x + 31$ and the line $x + y = 10$. **[5]**

(ii) Express $4x^2 + 24x + 31$ in the form $a(x + b)^2 + c$. **[4]**

(iii) For the curve $y = 4x^2 + 24x + 31$,

(A) write down the equation of the line of symmetry, **[1]**

(B) write down the minimum y-value on the curve. **[1]**

4 **(i)** Solve, by factorising, the equation $2x^2 - x - 3 = 0$. **[3]**

(ii) Sketch the graph of $y = 2x^2 - x - 3$. **[3]**

(iii) Show that the equation $x^2 - 5x + 10 = 0$ has no real roots. **[2]**

(iv) Find the x-coordinates of the points of intersection of the graphs of $y = 2x^2 - x - 3$ and $y = x^2 - 5x + 10$. Give your answer in the form $a \pm \sqrt{b}$. **[4]**