1

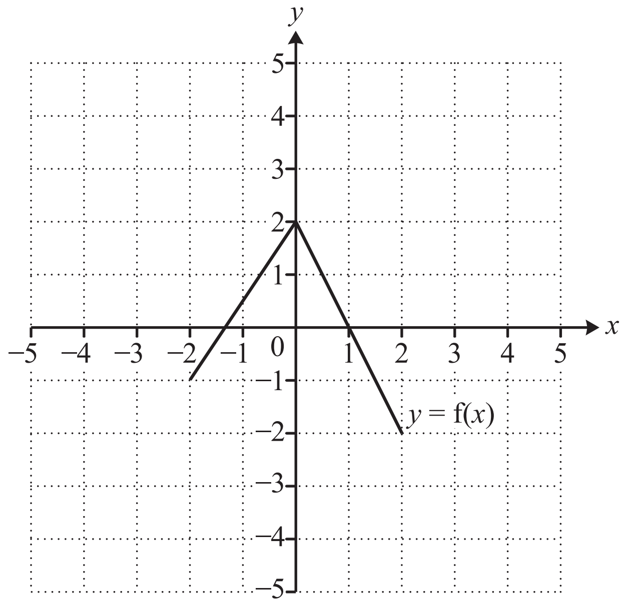

Fig. 3

Fig. 3 shows the graph of $y = \mathrm{f}(x)$. Draw the graphs of the following.

(i) $y = \mathrm{f}(x) - 2$ **[2]**

(ii) $y = \mathrm{f}(x - 3)$ **[2]**

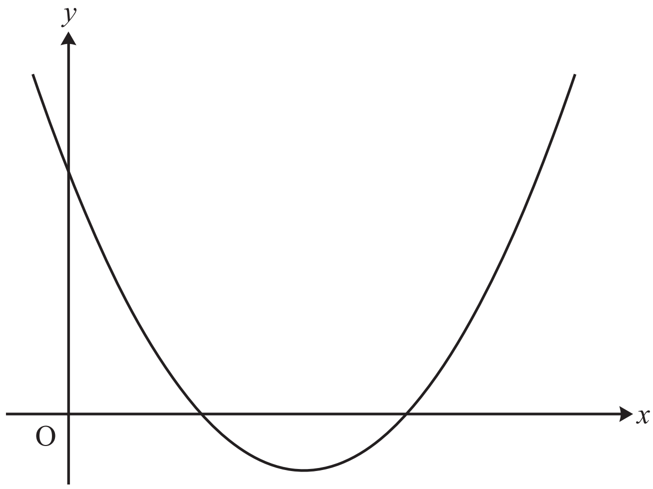

Fig. 11

Fig. 11 shows a sketch of the curve with equation $y = (x-4)^2 - 3$.

(i) Write down the equation of the line of symmetry of the curve and the coordinates of the minimum point. **[2]**

(ii) Find the coordinates of the points of intersection of the curve with the x-axis and the y-axis, using surds where necessary. **[4]**

(iii) The curve is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$. Show that the equation of the translated curve may be written as $y = x^2 - 12x + 33$. **[2]**

(iv) Show that the line $y = 8 - 2x$ meets the curve $y = x^2 - 12x + 33$ at just one point, and find the coordinates of this point. **[5]**

3

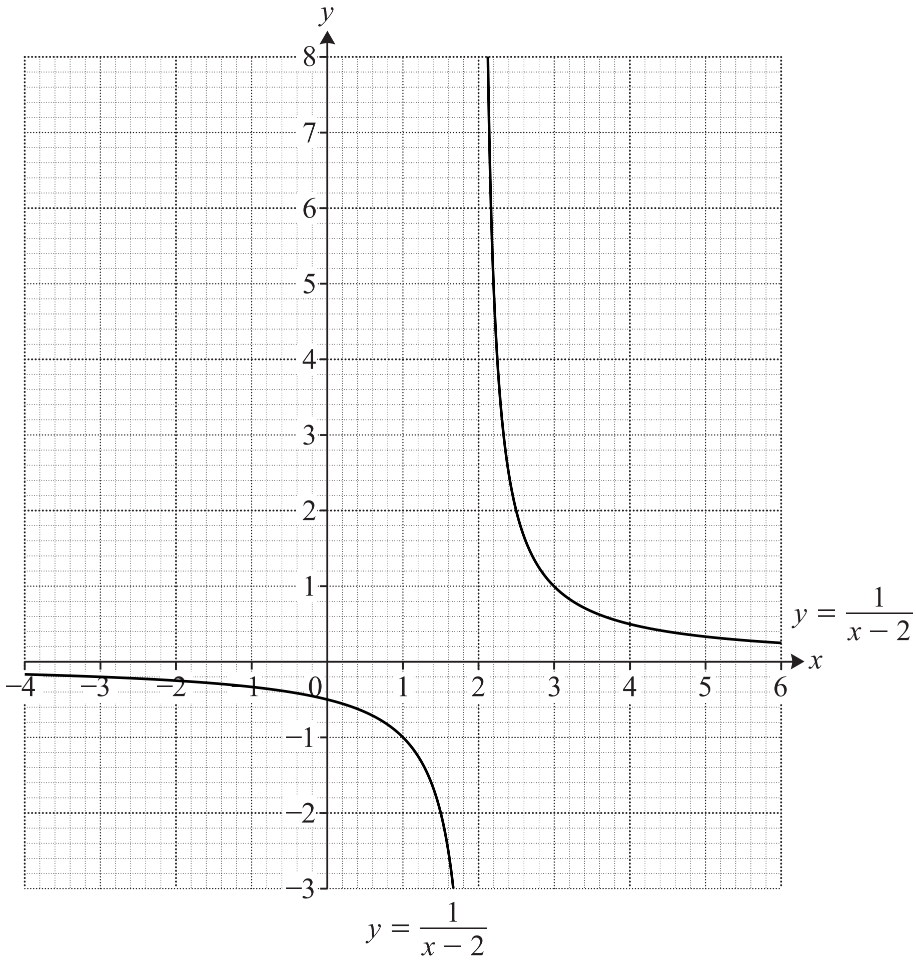

Fig. 12

Fig. 12 shows the graph of $y = \frac{1}{x-2}$.

(i) Draw accurately the graph of $y = 2x + 3$ on the copy of Fig. 12 and use it to estimate the coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = 2x + 3$. **[3]**

(ii) Show algebraically that the x-coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = 2x + 3$ satisfy the equation $2x^2 - x - 7 = 0$. Hence find the exact values of the x-coordinates of the points of intersection. **[5]**

(iii) Find the quadratic equation satisfied by the x-coordinates of the points of intersection of $y = \frac{1}{x-2}$ and $y = -x + k$. Hence find the exact values of k for which $y = -x + k$ is a tangent to $y = \frac{1}{x-2}$. **[4]**

4

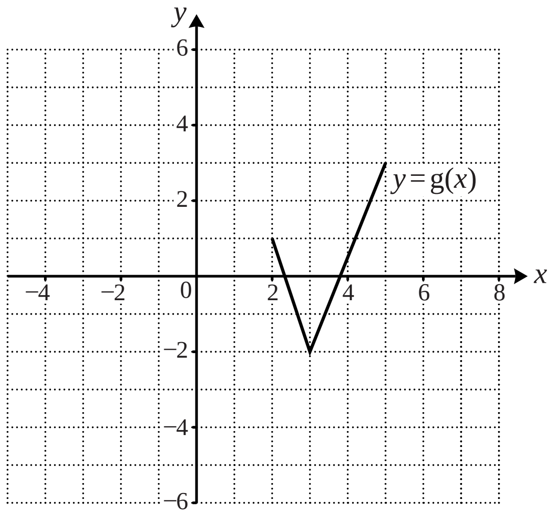

Fig. 7

Fig. 7 shows the graph of $y = \mathrm{g}(x)$. Draw the graphs of the following.

(i) $y = \mathrm{g}(x) + 3$ **[2]**

(ii) $y = \mathrm{g}(x + 2)$ **[2]**

5 The point P (5, 4) is on the curve $y = \mathrm{f}(x)$. State the coordinates of the image of P when the graph of $y = \mathrm{f}(x)$ is transformed to the graph of

(i) $y = \mathrm{f}(x - 5)$, **[2]**

(ii) $y = \mathrm{f}(x) + 7$. **[2]**

6 **(i)** Describe fully the transformation which maps the curve $y = x^2$ onto the curve $y = (x + 4)^2$. **[2]**

(ii) Sketch the graph of $y = x^2 - 4$. **[2]**

7 **(i)** Find the equation of the line passing through A $(-1, 1)$ and B $(3, 9)$. [3]

(ii) Show that the equation of the perpendicular bisector of AB is $2y + x = 11$. [4]

(iii) A circle has centre $(5, 3)$, so that its equation is $(x - 5)^2 + (y - 3)^2 = k$. Given that the circle passes through A, show that $k = 40$. Show that the circle also passes through B. [2]

(iv) Find the x-coordinates of the points where this circle crosses the x-axis. Give your answers in surd form. [3]