1 **(i)** A curve has equation $y = x^2 - 4$. Find the x-coordinates of the points on the curve where $y = 21$. [2]

(ii) The curve $y = x^2 - 4$ is translated by $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$.

Write down an equation for the translated curve. You need not simplify your answer. [2]

2

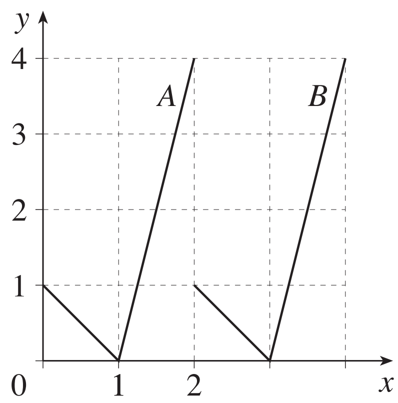

Fig. 2

Fig. 2 shows graphs A and B.

(i) State the transformation which maps graph A onto graph B. [2]

(ii) The equation of graph A is $y = f(x)$.

Which one of the following is the equation of graph B?

$y = f(x) + 2$	$y = f(x) - 2$	$y = f(x+2)$	$y = f(x-2)$
$y = 2f(x)$	$y = f(x+3)$	$y = f(x-3)$	$y = 3f(x)$

[2]

3 You are given that $f(x) = (x+3)(x-2)(x-5)$.

(i) Sketch the curve $y = f(x)$. **[3]**

(ii) Show that $f(x)$ may be written as $x^3 - 4x^2 - 11x + 30$. **[2]**

(iii) Describe fully the transformation that maps the graph of $y = f(x)$ onto the graph of $y = g(x)$, where $g(x) = x^3 - 4x^2 - 11x - 6$. **[2]**

(iv) Show that $g(-1) = 0$. Hence factorise $g(x)$ completely. **[5]**

4 **(i)** You are given that $f(x) = (2x - 5)(x - 1)(x - 4)$.

(A) Sketch the graph of $y = f(x)$. **[3]**

(B) Show that $f(x) = 2x^3 - 15x^2 + 33x - 20$. **[2]**

(ii) You are given that $g(x) = 2x^3 - 15x^2 + 33x - 40$.

(A) Show that $g(5) = 0$. **[1]**

(B) Express $g(x)$ as the product of a linear and quadratic factor. **[3]**

(C) Hence show that the equation $g(x) = 0$ has only one real root. **[2]**

(iii) Describe fully the transformation that maps $y = f(x)$ onto $y = g(x)$. **[2]**