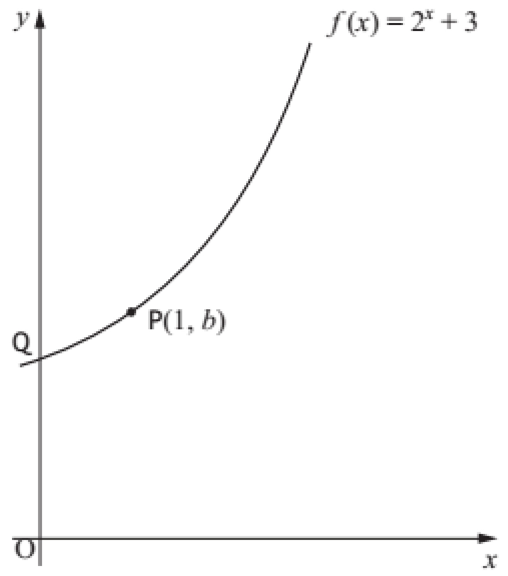
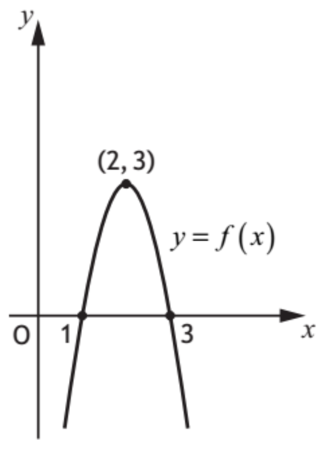
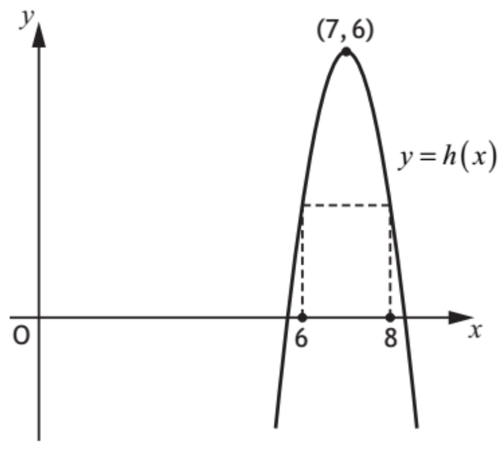
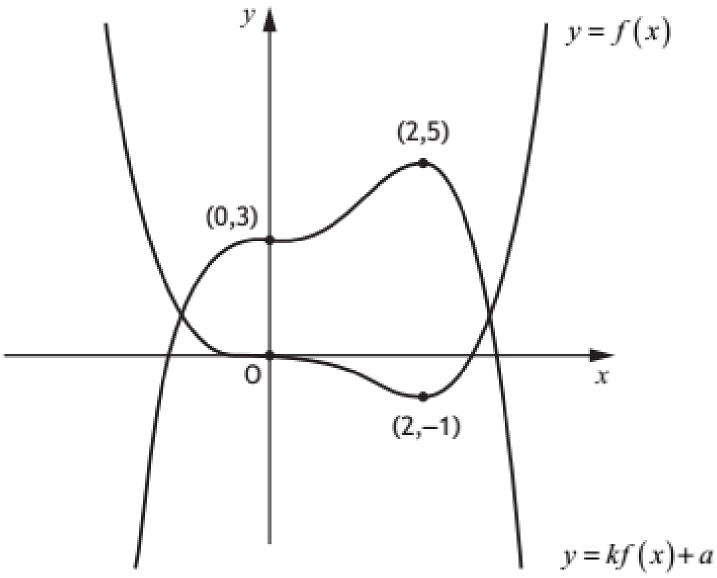
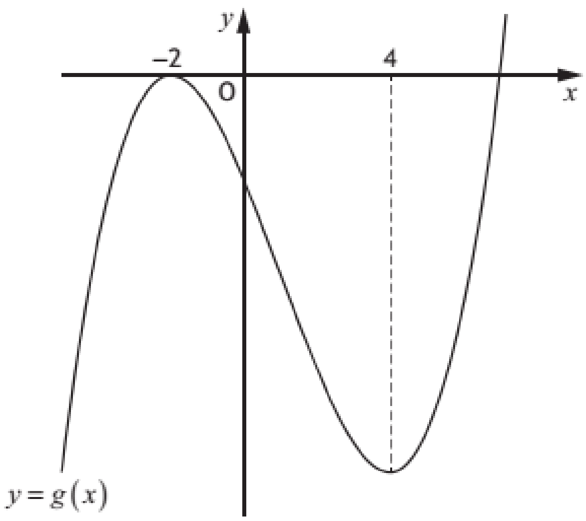
Y	Q	P	FUNCTIONS
15	5	1	A function g is defined on $\mathbb{R}$, the set of real numbers, by $g(x) = 6 - 2x$. (a) Determine an expression for $g^{-1}(x)$. **2** (b) Write down an expression for $g(g^{-1}(x))$. **1**
15	13	1	The function $f(x) = 2^x + 3$ is defined on $\mathbb{R}$, the set of real numbers. The graph with equation $y = f(x)$ passes through the point P$(1, b)$ and cuts the y-axis at Q as shown in the diagram.  (a) What is the value of b? **1** (b) (i) Copy the above diagram. On the same diagram, sketch the graph with equation $y = f^{-1}(x)$. **1** (ii) Write down the coordinates of the images of P and Q. **3** (c) R $(3,11)$ also lies on the graph with equation $y = f(x)$. Find the coordinates of the image of R on the graph with equation $y = 4 - f(x + 1)$. **2**
15	2	2	Functions f and g are defined on suitable domains by $f(x) = 10 + x$ and $g(x) = (1 + x)(3 - x) + 2$. (a) Find an expression for $f(g(x))$. **2** (b) Express $f(g(x))$ in the form $p(x + q)^2 + r$. **3** (c) Another function h is given by $h(x) = \dfrac{1}{f(g(x))}$. What values of x cannot be in the domain of h? **2**

16	6	1	Functions f and g are defined on $\mathbb{R}$, the set of real numbers. The inverse functions f^{-1} and g^{-1} both exist. (a) Given $f(x)=3x+5$, find $f^{-1}(x)$. (b) If $g(2)=7$, write down the value of $g^{-1}(7)$.	 **3** **1**
16	12	1	The functions f and g are defined on $\mathbb{R}$, the set of real numbers by $f(x)=2x^2-4x+5$ and $g(x)=3-x$. (a) Given $h(x)=f(g(x))$, show that $h(x)=2x^2-8x+11$. (b) Express $h(x)$ in the form $p(x+q)^2+r$.	 **2** **3**
17	1	1	Functions f and g are defined on suitable domains by $f(x)=5x$ and $g(x)=2\cos x$. (a) Evaluate $f(g(0))$. (b) Find an expression for $g(f(x))$.	 **1** **2**
17	6	1	A function, h, is defined by $h(x)=x^3+7$, where $x\in\mathbb{R}$. Determine an expression for $h^{-1}(x)$.	 **3**
17	15	1	A quadratic function, f, is defined on $\mathbb{R}$, the set of real numbers. Diagram 1 shows part of the graph with equation $y=f(x)$. The turning point is (2, 3). Diagram 2 shows part of the graph with equation $y=h(x)$. The turning point is (7, 6).  Diagram 1  Diagram 2 (a) Given that $h(x)=f(x+a)+b$. Write down the values of a and b.	 **2**

18	2	1	A function $g(x)$ is defined on $\mathbb{R}$, the set of real numbers, by $$g(x) = \frac{1}{5}x - 4.$$ Find the inverse function, $g^{-1}(x)$. **3**
18	6	2	Functions, f and g, are given by $f(x) = 3 + \cos x$ and $g(x) = 2x$, $x \in \mathbb{R}$. (a) Find expressions for (i) $f(g(x))$ and **2** (ii) $g(f(x))$. **1**
19	10	1	The diagram shows the graphs with equations $y = f(x)$ and $y = kf(x) + a$.  (a) State the value of a. **1** (b) Find the value of k. **1**
19	12	1	Functions f and g are defined by • $f(x) = \frac{1}{\sqrt{x}}$, where $x > 0$ • $g(x) = 5 - x$, where $x \in \mathbb{R}$. (a) Determine an expression for $f(g(x))$. **2** (b) State the range of values of x for which $f(g(x))$ is undefined. **1**

19	5	2	The diagram below shows the graph of a cubic function $y = g(x)$, with stationary points at $x = -2$ and $x = 4$.  On the diagram in your answer booklet, sketch the graph of $y = g'(x)$. **2**
19	8	2	A function, f, is given by $f(x) = \sqrt[3]{x} + 8$. The domain of f is $1 \leq x \leq 1000$, $x \in \mathbb{R}$. The inverse function, f^{-1}, exists. (a) Find $f^{-1}(x)$. **3** (b) State the domain of f^{-1}. **1**
22	3	1	A function, h, is defined by $h(x) = 4 + \frac{1}{3}x$, where $x \in \mathbb{R}$. Find the inverse function, $h^{-1}(x)$. **3**

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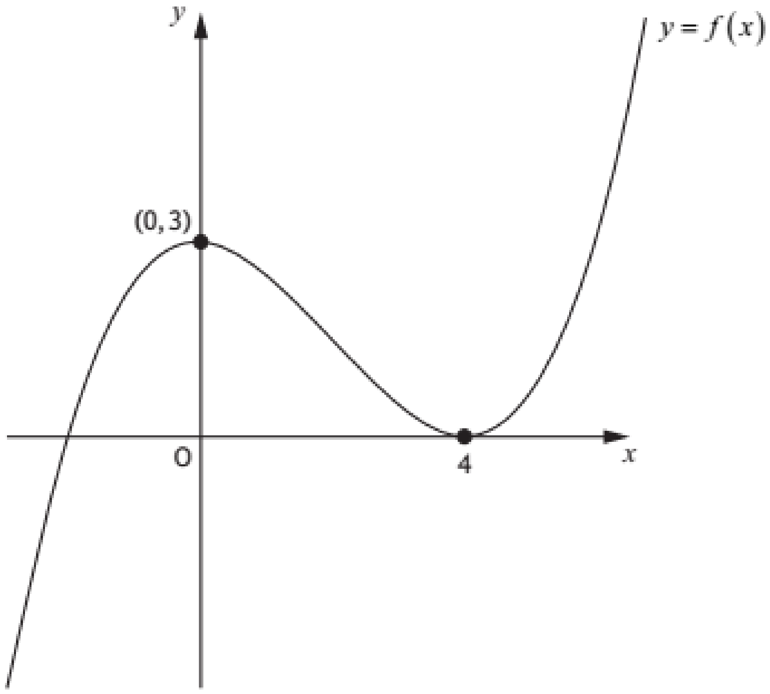
The diagram shows the graph of a cubic function with equation $y = f(x)$.
The curve has stationary points at $(0, 3)$ and $(4, 0)$.


(a) Sketch the graph of $y = 2f(x) + 1$. 3
Use the diagram provided in the answer booklet.
(b) State the coordinates of the stationary points on the graph of $y = f\left(\frac{1}{2}x\right)$. 1
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Functions f and g are given by $f(x) = x^2 \quad 2$ and $g(x) = 3x \quad 5$, $x \in \mathbb{R}$.
(a) Find expressions for:
(i) $f(g(x))$ and 2
(ii) $g(f(x))$. 1
(b) Determine the range of values of x for which $f(g(x)) < g(f(x))$. 4
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