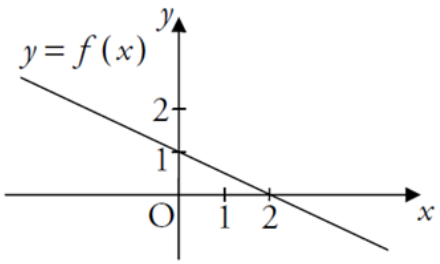
1. (*a*) Show that $f(x) = 2x^2 - 4x + 5$ can be written in the form $f(x) = a(x+b)^2 + c$. **3**

   (*b*) Hence write down the coordinates of the stationary point of $y = f(x)$ and state its nature. **2**

2. (a) The diagram below shows the graph of $y = f(x)$.

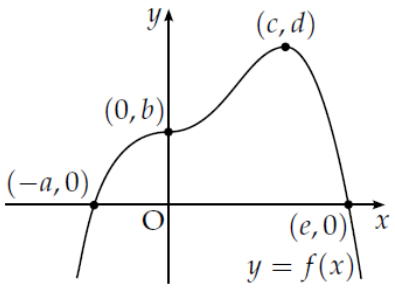


   By first finding the equation of the given line $y = f(x)$ find algebraically and then sketch the graph of $y = f^{-1}(x)$ showing clearly the intersection with the axes. **5**

   (b) The graph of a function f intersects the x-axis at $(-a, 0)$ and $(e, 0)$ as shown.

   There is a point of inflexion at $(0, b)$ and a maximum turning point at (c, d).

   Sketch the graph of the derived function f'. **3**

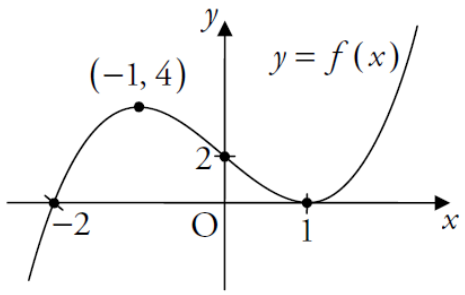


3. A function g is defined by $g(x) = 4^x$ for all real x such that $-1 \le x \le 1$.

   Identify the range of g. **3**

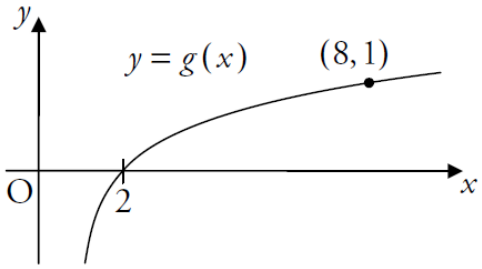
4. Sketch the graph of $y = \cos(x° + 45°) - 1$ for $0 \le x \le 360$. **3**

5. The graph of $y = f(x)$ is shown below.



Sketch the graph of $y = 4 - f(x+1)$, showing the effect on the four points shown. **4**

6. A function g is defined by $g(x) = \log_a(x+b)$ where $a > 1$ and b are constants. The graph of $y = g(x)$ is shown below.



(a) Find the values of a and b. **2**

(b) State the values of $x \in \mathbb{R}$ for which $g(x)$ is undefined. **1**

7. Three functions f, g and h are defined, on suitable domains, as follows:

$$f(x) = \tfrac{1}{3}x \qquad g(x) = 2x - 5 \qquad h(x) = \tfrac{1}{2}(3x+5)$$

(a) Calculate $k(x) = f(g(x))$. **2**

(b) (i) Find $h(k(x))$ and $k(h(x))$. **4**

(ii) Hence state the relationship between the functions h and k. **1**

33 Marks