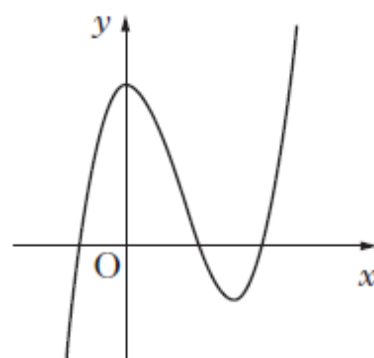The functions f and g are defined by $f(x) = x^2 + 1$ and $g(x) = 3x - 4$, on the set of real numbers.

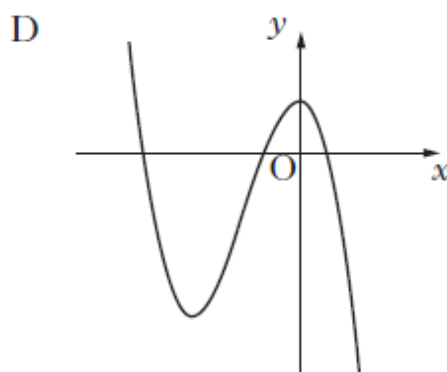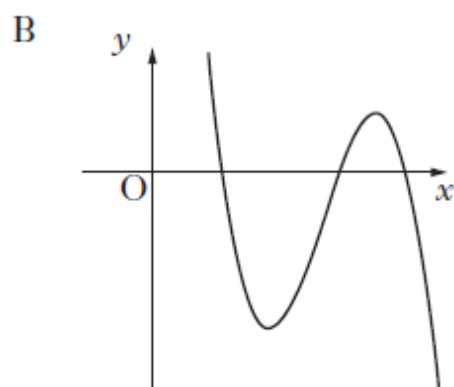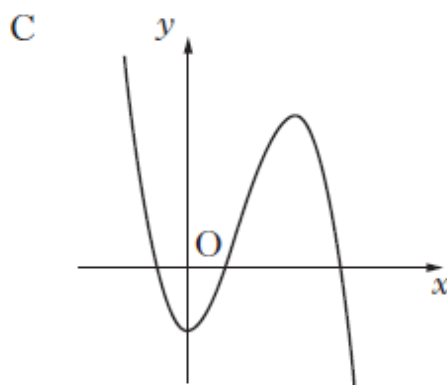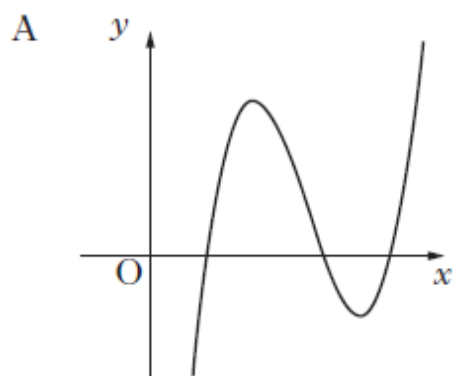Find $g(f(x))$.

A $3x^2 - 1$

B $9x^2 - 15$

C $9x^2 + 17$

D $3x^3 - 4x^2 + 3x - 4$

The diagram shows a cubic curve with equation $y = f(x)$.

Which of the following diagrams could show the curve with equation
$y = -f(x - k),\ k > 0$?

A

C

B

D

A function f is defined on a suitable domain by $f(x) = \dfrac{x+2}{x^2 - 7x + 12}$.

What value(s) of x cannot be in this domain?

A   3 and 4

B -3 and -4

C -2

D   0

Functions f and g are defined on the set of real numbers by

- $f(x) = x^2 + 3$
- $g(x) = x + 4$.

(a) Find expressions for:

     (i) $f(g(x))$;

     (ii) $g(f(x))$.   3

(b) Show that $f(g(x)) + g(f(x)) = 0$ has no real roots.   3

A function f is given by $f(x) = \sqrt{9 - x^2}$.

What is a suitable domain of f?

A $x \geq 3$

B $x \leq 3$

C $-3 \leq x \leq 3$

D $-9 \leq x \leq 9$

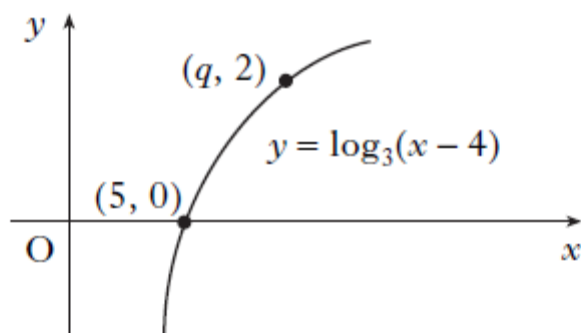Functions f, g and h are defined on suitable domains by

$$f(x) = x^2 - x + 10, \ g(x) = 5 - x \text{ and } h(x) = \log_2 x.$$

(a) Find expressions for $h(f(x))$ and $h(g(x))$.   **3**

(b) Hence solve $h(f(x)) - h(g(x)) = 3$.   **5**

The diagram shows part of the graph of $y = \log_3(x - 4)$.
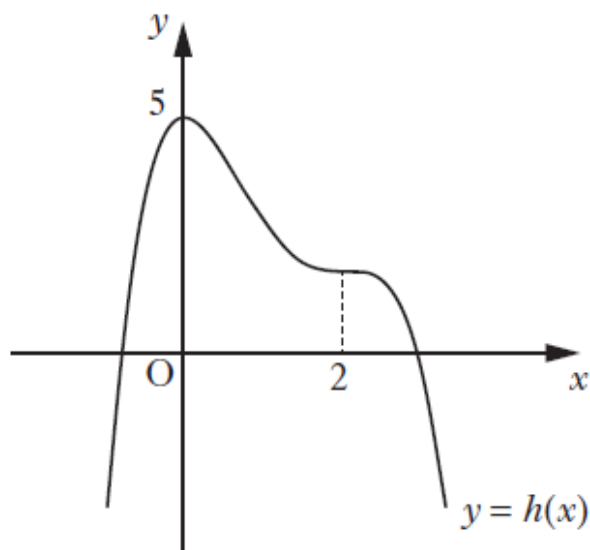
The point $(q, 2)$ lies on the graph.

What is the value of q?

A   6

B   7

C   8

D   13

The diagram below shows the graph of a quartic $y = h(x)$, with stationary points at $x = 0$ and $x = 2$.

On separate diagrams sketch the graphs of:

(a) $y = h'(x)$;   3

(b) $y = 2 - h'(x)$.   3