

Modulus Functions

1.

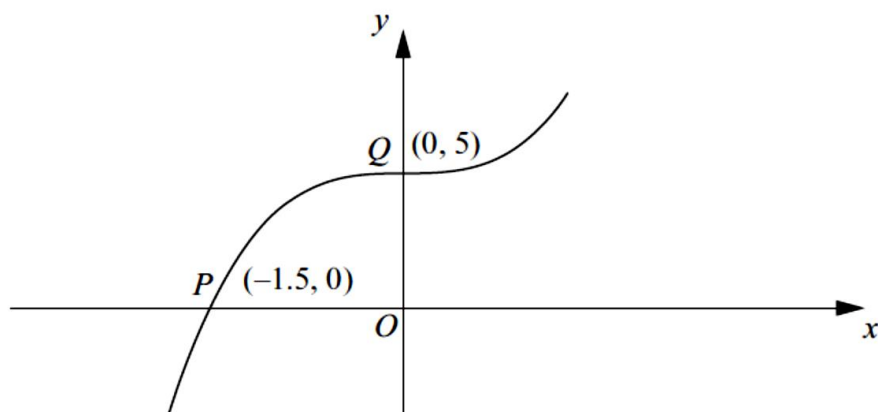


Figure 2

Figure 2 shows part of the curve with equation $y = f(x)$
 The curve passes through the points $P(-1.5, 0)$ and $Q(0, 5)$ as shown.

On separate diagrams, sketch the curve with equation

(a) $y = |f(x)|$ (2)

(b) $y = f(|x|)$ (2)

(c) $y = 2f(3x)$ (3)

Indicate clearly on each sketch the coordinates of the points at which the curve crosses or meets the axes.

2.

Solve the equation $|3 - 2x| = 4|x|$. [4]

3.

Given that $f(x) = |x|$ and $g(x) = x + 1$, sketch the graphs of the composite functions $y = fg(x)$ and $y = gf(x)$, indicating clearly which is which. [4]

4.

Figure 1

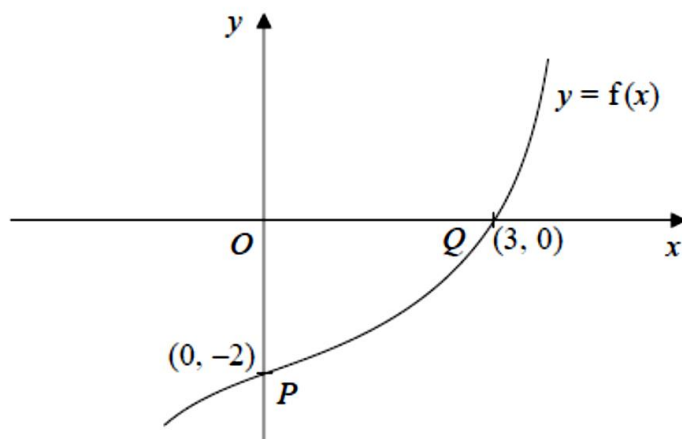


Figure 1 shows part of the curve with equation $y = f(x)$, $x \in \mathbb{R}$, where f is an increasing function of x . The curve passes through the points $P(0, -2)$ and $Q(3, 0)$ as shown.

In separate diagrams, sketch the curve with equation

(a) $y = |f(x)|$, (3)

(b) $y = f^{-1}(x)$, (3)

(c) $y = \frac{1}{2}f(3x)$. (3)

Indicate clearly on each sketch the coordinates of the points at which the curve crosses or meets the axes.

5.

Find the exact solutions of the equation $|4x - 5| = |3x - 5|$. [4]

6.

Solve the inequality $|2x - 5| > |x + 1|$. [5]

7.

Solve the inequality $|2x + 1| > 4$. [3]

8.

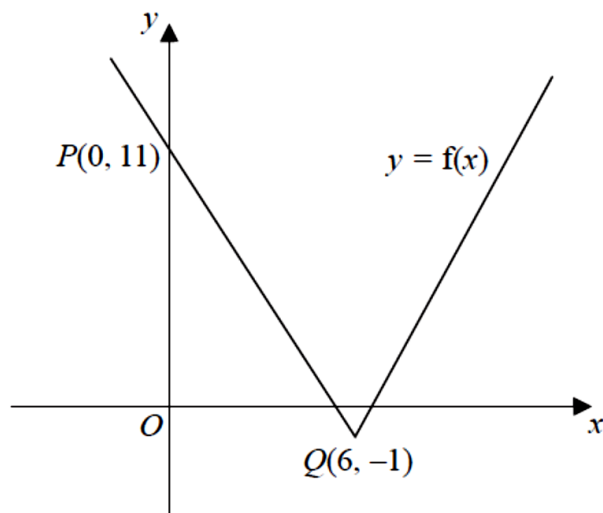


Figure 1

Figure 1 shows part of the graph with equation $y = f(x)$, $x \in \mathbb{R}$.

The graph consists of two line segments that meet at the point $Q(6, -1)$.

The graph crosses the y -axis at the point $P(0, 11)$.

Sketch, on separate diagrams, the graphs of

(a) $y = |f(x)|$ (2)

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

On each diagram, show the coordinates of the points corresponding to P and Q .

Given that $f(x) = a|x - b| - 1$, where a and b are constants,

(c) state the value of a and the value of b . (2)

9.

(i) Solve the inequality $|2x + 1| \leq |x - 3|$. [5]

(ii) Given that x satisfies the inequality $|2x + 1| \leq |x - 3|$, find the greatest possible value of $|x + 2|$. [2]

10.

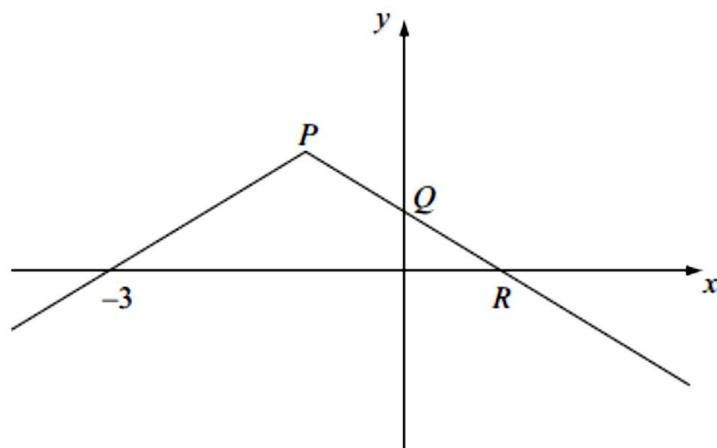


Figure 1

Figure 1 shows the graph of $y = f(x)$, $x \in \mathbb{R}$.

The graph consists of two line segments that meet at the point P .

The graph cuts the y -axis at the point Q and the x -axis at the points $(-3, 0)$ and R .

Sketch, on separate diagrams, the graphs of

(a) $y = |f(x)|$, (2)

(b) $y = f(-x)$. (2)

Given that $f(x) = 2 - |x + 1|$,

(c) find the coordinates of the points P , Q and R , (3)

(d) solve $f(x) = \frac{1}{2}x$. (5)

11.

The function f is defined by

$$f: x \mapsto |2x - 5|, \quad x \in \mathbb{R}$$

(a) Sketch the graph with equation $y = f(x)$, showing the coordinates of the points where the graph cuts or meets the axes. (2)

(b) Solve $f(x) = 15 + x$. (3)

The function g is defined by

$$g : x \mapsto x^2 - 4x + 1, \quad x \in \mathbb{R}, \quad 0 \leq x \leq 5$$

(c) Find $fg(2)$.

(2)

(d) Find the range of g .

(3)
