Edexcel Maths C3

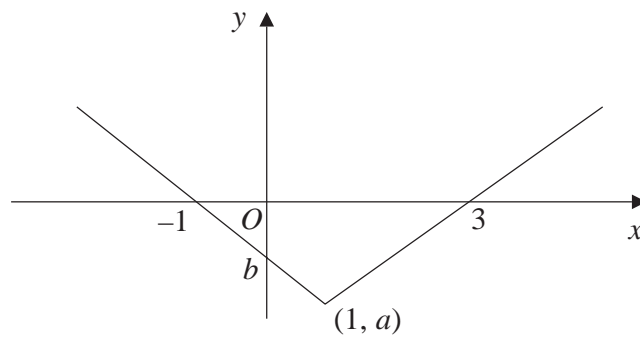Topic Questions from Papers

Transformations

**6.** **Figure 1**



Figure 1 shows part of the graph of $y = f(x)$, $x \in \mathbb{R}$. The graph consists of two line segments that meet at the point $(1, a)$, $a < 0$. One line meets the $x$-axis at $(3, 0)$. The other line meets the $x$-axis at $(-1, 0)$ and the $y$-axis at $(0, b)$, $b < 0$.

In separate diagrams, sketch the graph with equation

(a)  $y = f(x + 1)$,

**(2)**

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

**(3)**

Indicate clearly on each sketch the coordinates of any points of intersection with the axes.

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

(c)  the value of $a$ and the value of $b$,

**(2)**

(d)  the value of $x$ for which $f(x) = 5x$.

**(4)**

**Question 6 continued**

N 2 3 4 9 4 B 0 1 5 2 0

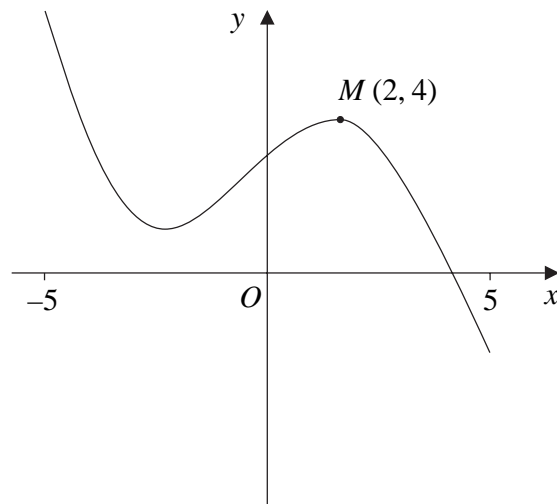**1.**                                    **Figure 1**



Figure 1 shows the graph of $y = f(x)$, $-5 \leqslant x \leqslant 5$.
The point $M$ (2, 4) is the maximum turning point of the graph.

Sketch, on separate diagrams, the graphs of

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

**(2)**

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

**(2)**

(c)  $y = f(|x|)$.

**(3)**

Show on each graph the coordinates of any maximum turning points.

Leave
blank

**Question 1 continued**

**(Total 7 marks)**

Q1

N 2 3 4 9 5 A 0 3 2 0
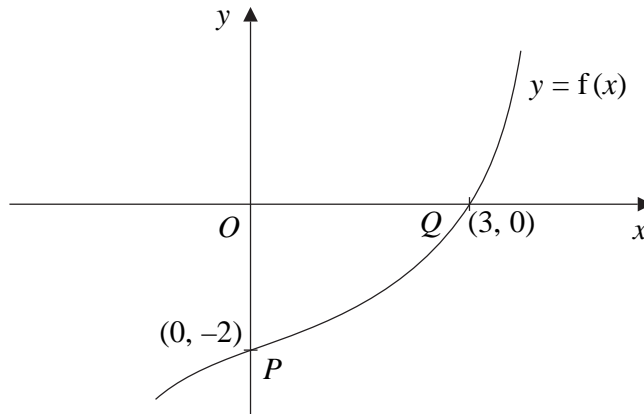
**3.**

**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.

Leave blank

**Question 3 continued**

N 2 3 5 8 1 A 0 6 2 4
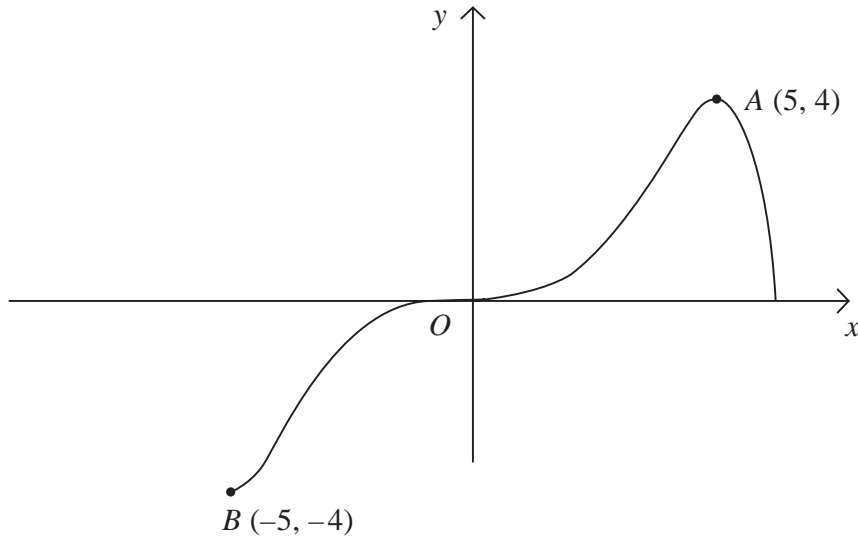
Leave
blank

**4.**



**Figure 1**

Figure 1 shows a sketch of the curve with equation $y = f(x)$.
The curve passes through the origin $O$ and the points $A(5, 4)$ and $B(-5, -4)$.

In separate diagrams, sketch the graph with equation

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

**(3)**

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

**(3)**

(c)   $y = 2f(x+1)$.

**(4)**

On each sketch, show the coordinates of the points corresponding to $A$ and $B$.
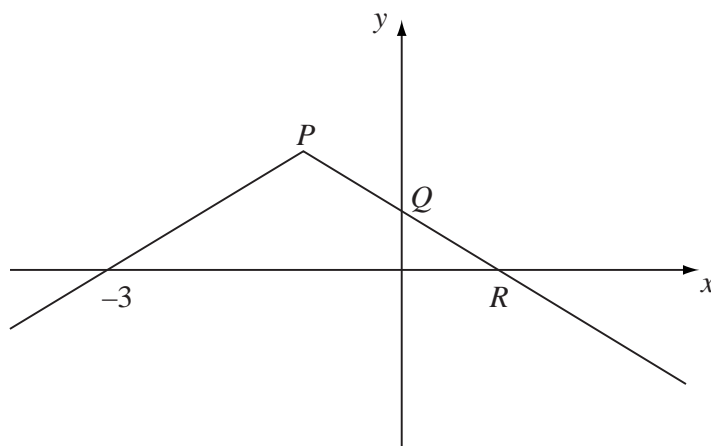
**Question 4 continued**

**3.**



**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 $f(x) = \dfrac{1}{2}x$.

(5)

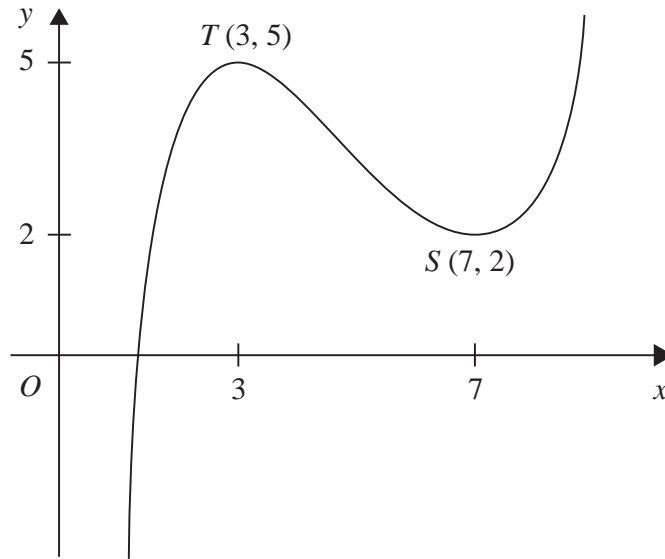Leave
blank

**Question 3 continued**

**3.**



**Figure 1**

Figure 1 shows the graph of $y = f(x)$,   $1 < x < 9$.
The points $T(3, 5)$ and $S(7, 2)$ are turning points on the graph.

Sketch, on separate diagrams, the graphs of

(a)  $y = 2f(x) - 4$,

**(3)**

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

**(3)**

Indicate on each diagram the coordinates of any turning points on your sketch.
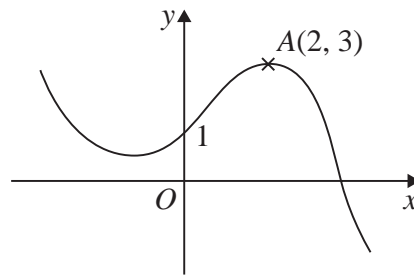
**6.**



**Figure 1**

Figure 1 shows a sketch of the graph of $y = f(x)$.

The graph intersects the $y$-axis at the point $(0, 1)$ and the point $A(2, 3)$ is the maximum turning point.

Sketch, on separate axes, the graphs of

(i) $y = f(-x) + 1$,

(ii) $y = f(x + 2) + 3$,

(iii) $y = 2f(2x)$.

On each sketch, show the coordinates of the point at which your graph intersects the $y$-axis and the coordinates of the point to which $A$ is transformed.
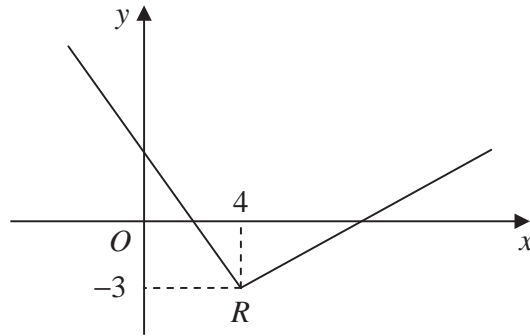
**(9)**

**Question 6 continued**

**3.**



**Figure 1**

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

The graph consists of two line segments that meet at the point $R(4, -3)$, as shown in Figure 1.

Sketch, on separate diagrams, the graphs of

(a)  $y = 2f(x+4)$,

**(3)**

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

**(3)**

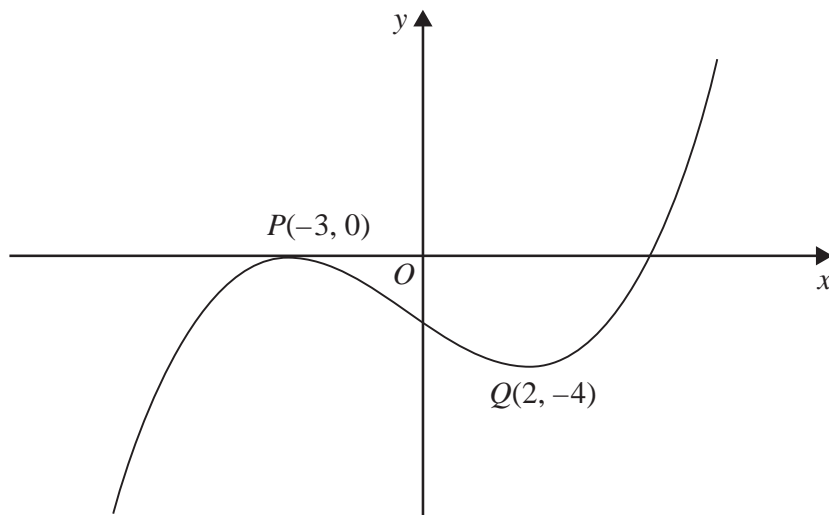On each diagram, show the coordinates of the point corresponding to *R*.

**2.**



**Figure 1**

Figure 1 shows the graph of equation $y = f(x)$.

The points $P(-3, 0)$ and $Q(2, -4)$ are stationary points on the graph.

Sketch, on separate diagrams, the graphs of

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

**(3)**

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

**(3)**

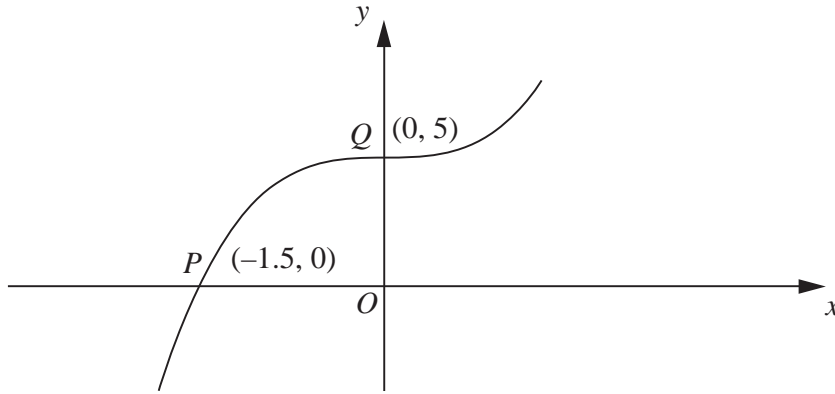On each diagram, show the coordinates of any stationary points.

**4.**



**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.

**Question 4 continued**
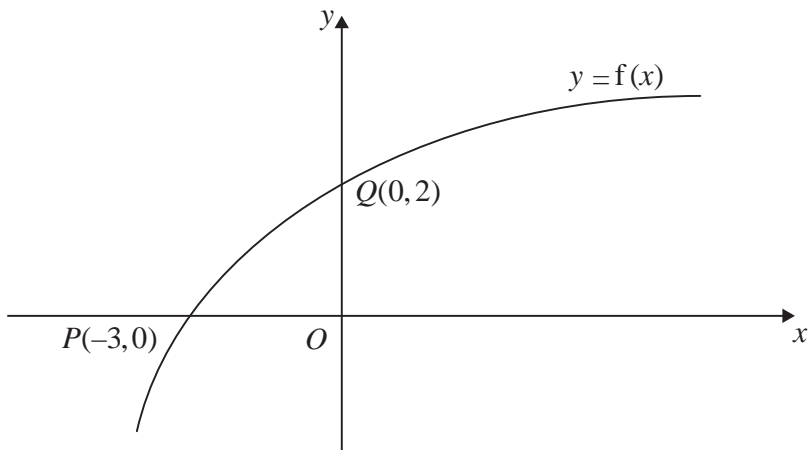
Leave blank

**3.**



**Figure 1**

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

The curve passes through the points $Q(0, 2)$ and $P(-3, 0)$ as shown.

(a) Find the value of $ff(-3)$.

**(2)**

On separate diagrams, sketch the curve with equation

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

**(2)**

(c) $y = f(|x|) - 2$,

**(2)**

(d) $y = 2f\left(\frac{1}{2}x\right)$.

**(3)**

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

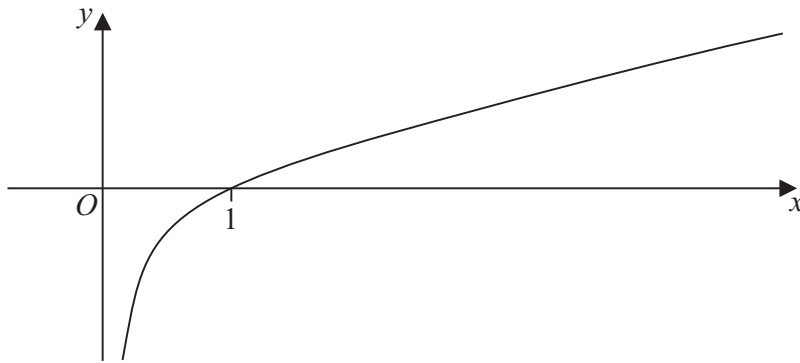P 4 1 4 8 6 A 0 6 2 8

**Question 3 continued**

**2.**



**Figure 1**

Figure 1 shows a sketch of the curve with equation $y = f(x)$, $x > 0$, where f is an increasing function of $x$. The curve crosses the $x$-axis at the point (1, 0) and the line $x = 0$ is an asymptote to the curve.

On separate diagrams, sketch the curve with equation

(a)  $y = f(2x)$,  $x > 0$

**(2)**

(b)  $y = |f(x)|$,  $x > 0$

**(3)**

Indicate clearly on each sketch the coordinates of the point at which the curve crosses or meets the $x$-axis.

**2.** Given that

$$f(x) = \ln x, \quad x > 0$$

sketch on separate axes the graphs of

(i)   $y = f(x)$,

(ii)  $y = |f(x)|$,

(iii) $y = -f(x - 4)$.

Show, on each diagram, the point where the graph meets or crosses the $x$-axis.
In each case, state the equation of the asymptote.

**(7)**

# Core Mathematics C3

**Candidates sitting C3 may also require those formulae listed under Core Mathematics C1 and C2.**

## *Logarithms and exponentials*

$$e^{x \ln a} = a^x$$

## *Trigonometric identities*

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B} \qquad (A \pm B \neq (k + \tfrac{1}{2})\pi)$$

$$\sin A + \sin B = 2 \sin \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\sin A - \sin B = 2 \cos \frac{A+B}{2} \sin \frac{A-B}{2}$$

$$\cos A + \cos B = 2 \cos \frac{A+B}{2} \cos \frac{A-B}{2}$$

$$\cos A - \cos B = -2 \sin \frac{A+B}{2} \sin \frac{A-B}{2}$$

## *Differentiation*

| $\mathbf{f}(x)$ | $\mathbf{f}'(x)$ |
|---|---|
| $\tan kx$ | $k \sec^2 kx$ |
| $\sec x$ | $\sec x \tan x$ |
| $\cot x$ | $-\mathrm{cosec}^2 x$ |
| $\mathrm{cosec}\, x$ | $-\mathrm{cosec}\, x \cot x$ |
| $\dfrac{\mathrm{f}(x)}{\mathrm{g}(x)}$ | $\dfrac{\mathrm{f}'(x)\,\mathrm{g}(x) - \mathrm{f}(x)\,\mathrm{g}'(x)}{(\mathrm{g}(x))^2}$ |

# Core Mathematics C2

**Candidates sitting C2 may also require those formulae listed under Core Mathematics C1.**

*Cosine rule*

$$a^2 = b^2 + c^2 - 2bc \cos A$$

*Binomial series*

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n \quad (n \in \mathbb{N})$$

$$\text{where } \binom{n}{r} = {}^nC_r = \frac{n!}{r!(n-r)!}$$

$$(1+x)^n = 1 + nx + \frac{n(n-1)}{1 \times 2}x^2 + \ldots + \frac{n(n-1)\ldots(n-r+1)}{1 \times 2 \times \ldots \times r}x^r + \ldots \quad (|x| < 1, n \in \mathbb{R})$$

*Logarithms and exponentials*

$$\log_a x = \frac{\log_b x}{\log_b a}$$

*Geometric series*

$$u_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r}$$

$$S_\infty = \frac{a}{1-r} \text{ for } |r| < 1$$

*Numerical integration*

The trapezium rule: $\int_a^b y \ dx \approx \frac{1}{2}h\{(y_0 + y_n) + 2(y_1 + y_2 + \ldots + y_{n-1})\}$, where $h = \dfrac{b-a}{n}$

# Core Mathematics C1

## *Mensuration*

Surface area of sphere $= 4\pi r^2$

Area of curved surface of cone $= \pi r \times$ slant height

## *Arithmetic series*

$u_n = a + (n-1)d$

$S_n = \dfrac{1}{2}n(a + l) = \dfrac{1}{2}n[2a + (n-1)d]$