

Transformations of $y = f(x)$

$$y = f(x)$$

Translation by $\begin{pmatrix} a \\ 0 \end{pmatrix}$

$$y = f(x - a)$$

Translation by $\begin{pmatrix} 0 \\ b \end{pmatrix}$

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

Stretch by scale factor $\frac{1}{a}$
parallel to x -axis

$$y = f(ax)$$

Stretch by scale factor b
parallel to y -axis

$$y = bf(x)$$

Reflection in y -axis

$$y = f(-x)$$

Reflection in x -axis

$$y = -f(x)$$

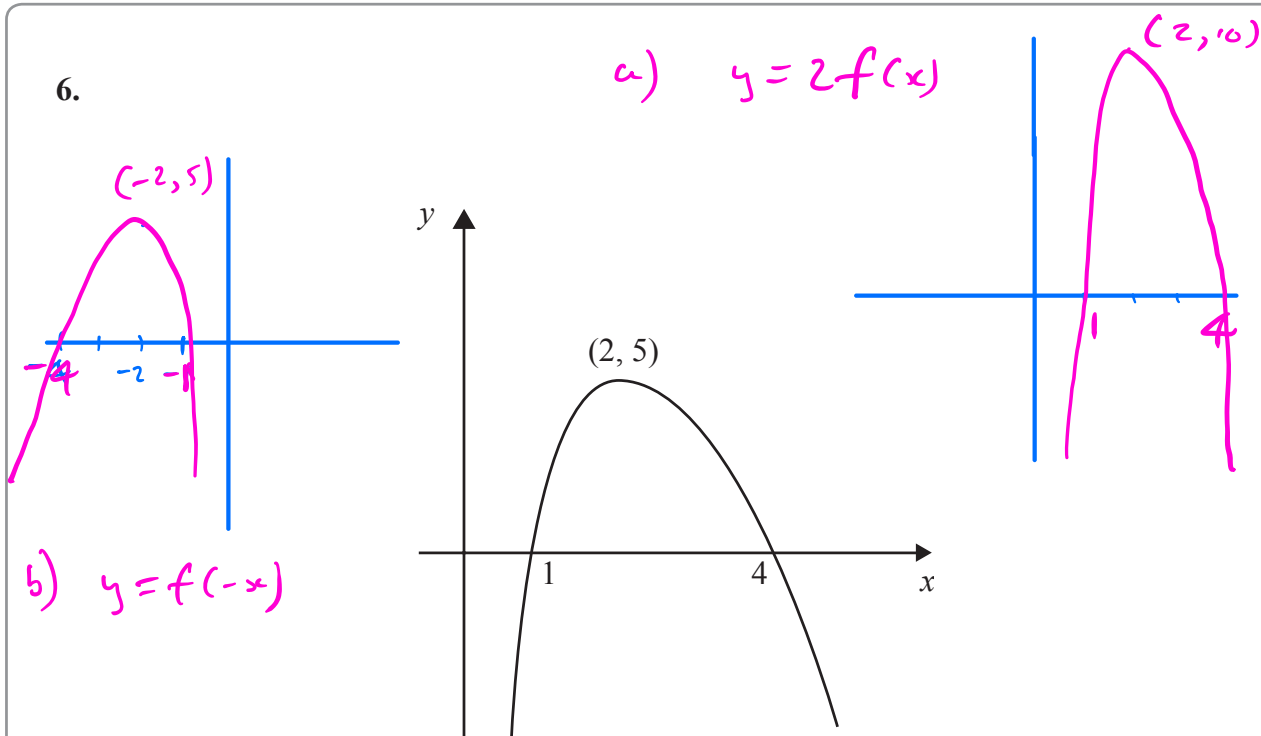


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve crosses the x -axis at the points $(1, 0)$ and $(4, 0)$. The maximum point on the curve is $(2, 5)$.

In separate diagrams sketch the curves with the following equations.

On each diagram show clearly the coordinates of the maximum point and of each point at which the curve crosses the x -axis.

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

(b) $y = f(-x)$. (3)

The maximum point on the curve with equation $y = f(x + a)$ is on the y -axis.

(c) Write down the value of the constant a . (1)

$a = 2$



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

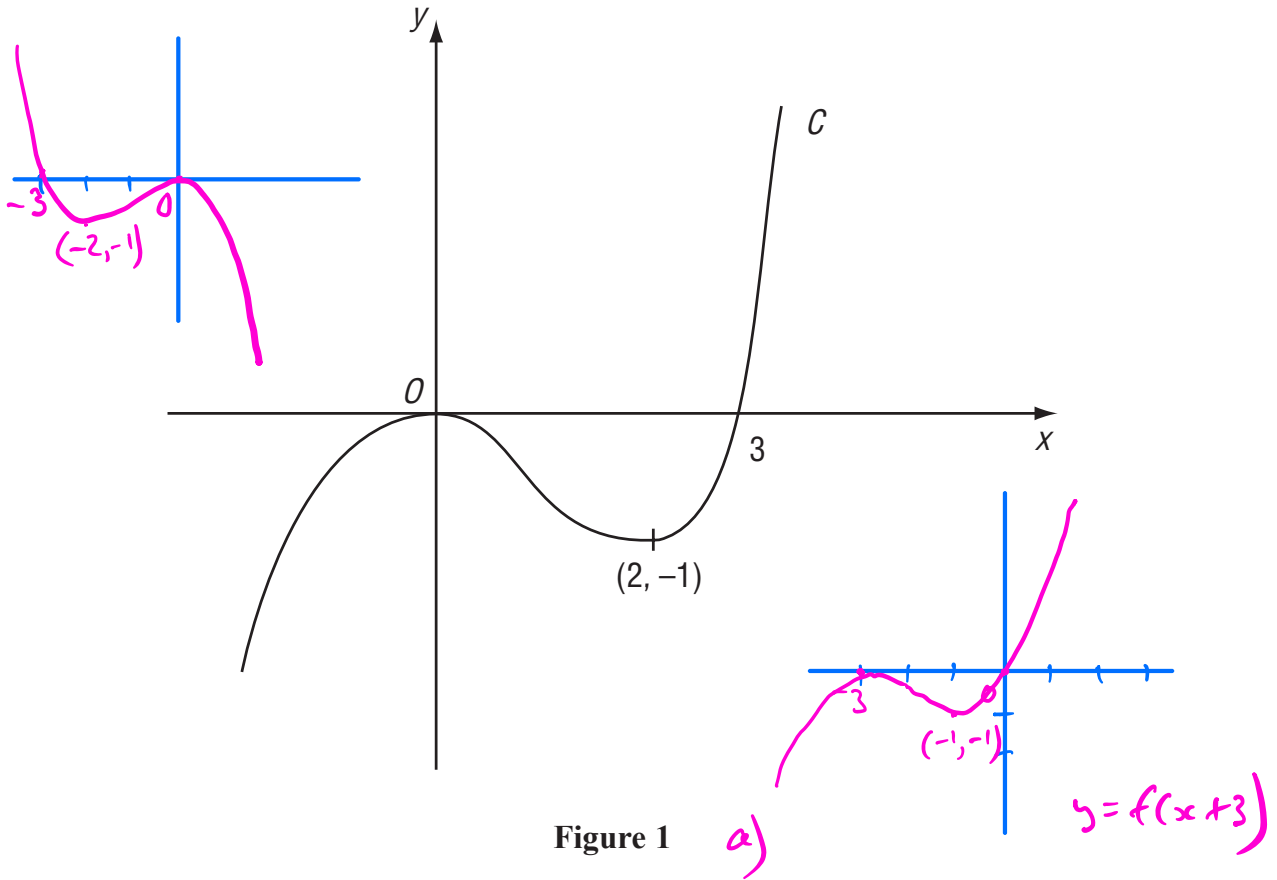


Figure 1

Figure 1 shows a sketch of the curve C with equation $y = f(x)$. There is a maximum at $(0, 0)$, a minimum at $(2, -1)$ and C passes through $(3, 0)$.

On separate diagrams sketch the curve with equation

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

(b) $y = f(-x)$. (3)

On each diagram show clearly the coordinates of the maximum point, the minimum point and any points of intersection with the x -axis.



8.

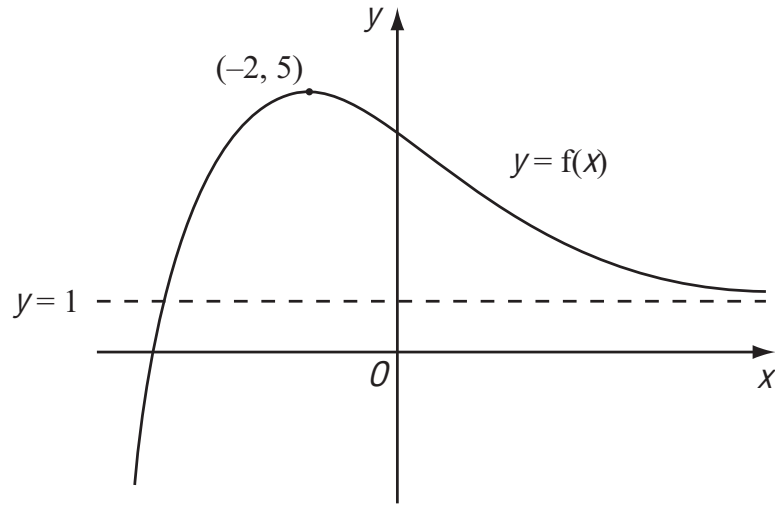


Figure 1

Figure 1 shows a sketch of part of the curve with equation $y = f(x)$.

The curve has a maximum point $(-2, 5)$ and an asymptote $y = 1$, as shown in Figure 1.

On separate diagrams, sketch the curve with equation

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

(b) $y = 4f(x)$ (2)

(c) $y = f(x + 1)$ (3)

On each diagram, show clearly the coordinates of the maximum point and the equation of the asymptote.



6.

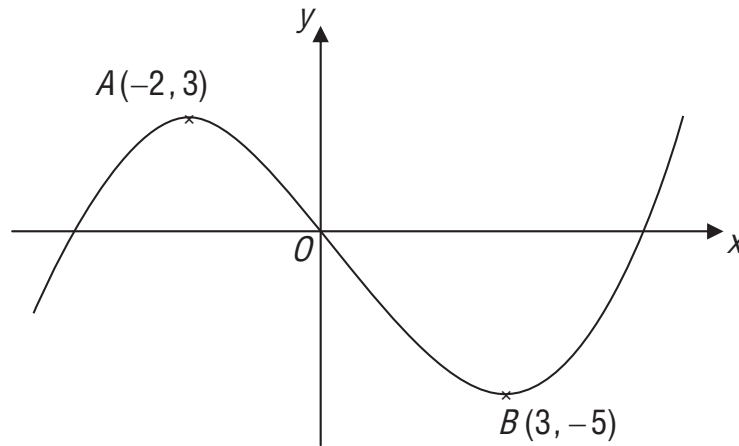


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve has a maximum point A at $(-2, 3)$ and a minimum point B at $(3, -5)$.

On separate diagrams sketch the curve with equation

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

(b) $y = 2f(x)$ **(3)**

On each diagram show clearly the coordinates of the maximum and minimum points.

The graph of $y = f(x) + a$ has a minimum at $(3, 0)$, where a is a constant.

(c) Write down the value of a . **(1)**



3.

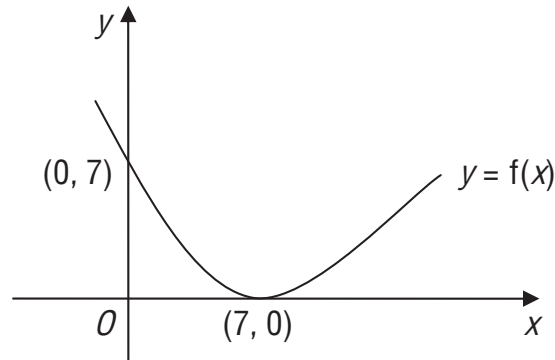


Figure 1

Figure 1 shows a sketch of the curve with equation $y = f(x)$. The curve passes through the point $(0, 7)$ and has a minimum point at $(7, 0)$.

On separate diagrams, sketch the curve with equation

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

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

On each diagram, show clearly the coordinates of the minimum point and the coordinates of the point at which the curve crosses the y -axis.

