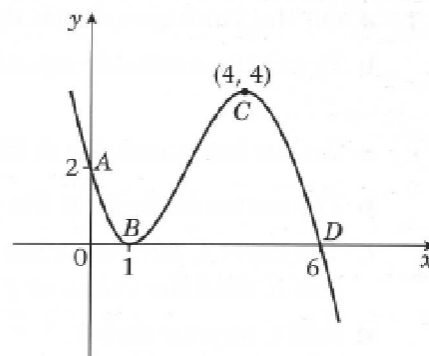


### Transformation of Curves

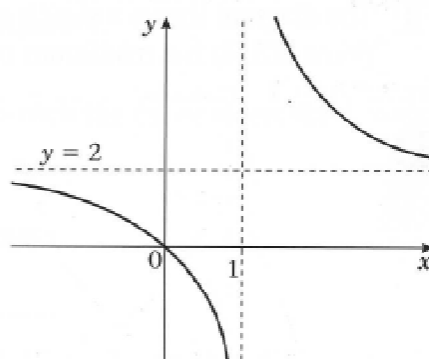
- 1** The following diagram shows a sketch of the curve with equation  $y = f(x)$ . The points  $A(0, 2)$ ,  $B(1, 0)$ ,  $C(4, 4)$  and  $D(6, 0)$  lie on the curve.



Sketch the following graphs and give the coordinates of the points  $A$ ,  $B$ ,  $C$  and  $D$  after each transformation:

- |                            |                     |                            |
|----------------------------|---------------------|----------------------------|
| <b>a</b> $f(x + 1)$        | <b>b</b> $f(x) - 4$ | <b>c</b> $f(x + 4)$        |
| <b>d</b> $f(2x)$           | <b>e</b> $3f(x)$    | <b>f</b> $f(\frac{1}{2}x)$ |
| <b>g</b> $\frac{1}{2}f(x)$ | <b>h</b> $f(-x)$    |                            |

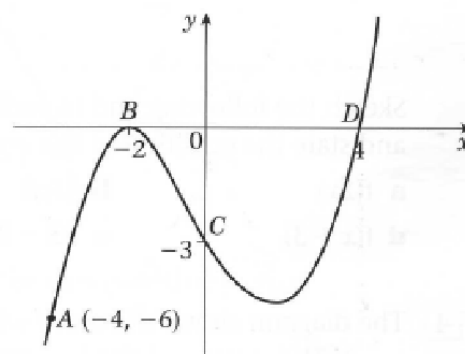
- 2** The curve  $y = f(x)$  passes through the origin and has horizontal asymptote  $y = 2$  and vertical asymptote  $x = 1$ , as shown in the diagram.



Sketch the following graphs and give the equations of any asymptotes and, for all graphs except **a**, give coordinates of intersections with the axes after each transformation.

- |                            |                     |                            |
|----------------------------|---------------------|----------------------------|
| <b>a</b> $f(x) + 2$        | <b>b</b> $f(x + 1)$ | <b>c</b> $2f(x)$           |
| <b>d</b> $f(x) - 2$        | <b>e</b> $f(2x)$    | <b>f</b> $f(\frac{1}{2}x)$ |
| <b>g</b> $\frac{1}{2}f(x)$ | <b>h</b> $-f(x)$    |                            |

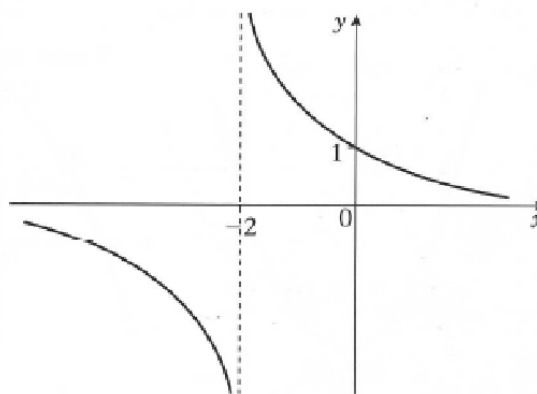
- 3** The curve with equation  $y = f(x)$  passes through the points  $A(-4, -6)$ ,  $B(-2, 0)$ ,  $C(0, -3)$  and  $D(4, 0)$  as shown in the diagram.



Sketch the following and give the coordinates of the points  $A$ ,  $B$ ,  $C$  and  $D$  after each transformation.

- |                            |                            |                  |
|----------------------------|----------------------------|------------------|
| <b>a</b> $f(x - 2)$        | <b>b</b> $f(x) + 6$        | <b>c</b> $f(2x)$ |
| <b>d</b> $f(x + 4)$        | <b>e</b> $f(x) + 3$        | <b>f</b> $3f(x)$ |
| <b>g</b> $\frac{1}{3}f(x)$ | <b>h</b> $f(\frac{1}{4}x)$ | <b>i</b> $-f(x)$ |
| <b>j</b> $f(-x)$           |                            |                  |

- 4** A sketch of the curve  $y = f(x)$  is shown in the diagram. The curve has a vertical asymptote with equation  $x = -2$  and a horizontal asymptote with equation  $y = 0$ . The curve crosses the  $y$ -axis at  $(0, 1)$ .



**a** Sketch, on separate diagrams, the graphs of:

- |                      |                   |                       |
|----------------------|-------------------|-----------------------|
| <b>i</b> $2f(x)$     | <b>ii</b> $f(2x)$ | <b>iii</b> $f(x - 2)$ |
| <b>iv</b> $f(x) - 1$ | <b>v</b> $f(-x)$  | <b>vi</b> $-f(x)$     |

In each case state the equations of any asymptotes and, if possible, points where the curve cuts the axes.

**b** Suggest a possible equation for  $f(x)$ .

5.

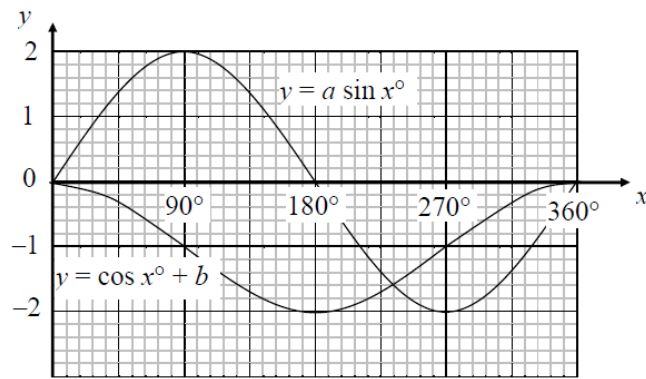


Diagram **NOT**  
accurately drawn

The diagram shows part of two graphs.

The equation of one graph is  $y = a \sin x^\circ$

The equation of the other graph is  $y = \cos x^\circ + b$

Find the values of the constants  $a$  and  $b$ .

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