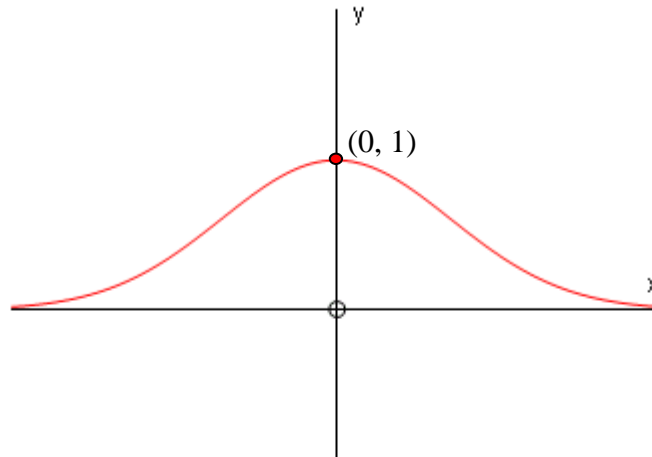# Edexcel AS Mathematics Graphs and transformations

Section 2: Transformations of graphs

Exercise level 2

Do not use a calculator or graph-drawing package for this exercise.

1. The diagram shows the graph of $y = f(x)$, which has a maximum point at (0, 1).

Sketch the following graphs, giving the coordinates of the maximum point in each case.

(i) $y = f(x - 2)$	(ii) $y = f(x + 3)$
(iii) $y = f(x) + 1$	(iv) $y = f(x) - 2$
(v) $y = f(x + 1) - 3$	(vi) $y = f(2x)$
(vii) $y = 3f(x)$	(viii) $y = f\left(\frac{1}{2}x\right)$

2. Find the equation of each new graph when the graph of $y = x^2 - x + 1$ undergoes each of the following transformations (starting with the original graph each time).

   (i)   Translation through $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ (ii)   Translation through $\begin{pmatrix} 0 \\ -1 \end{pmatrix}$

   (iii) Translation through $\begin{pmatrix} -1 \\ 2 \end{pmatrix}$

   (iv) One-way stretch scale factor 3 parallel to the y axis
   (v) One-way stretch scale factor $\frac{1}{2}$ parallel to the x axis.
   (vi) Reflection in the x-axis
   (vii) Reflection in the y-axis

3. State the transformation that must be applied to the graph of $y = x^n$ to obtain the graph of

   (i) $y = x^n - 4$

   (ii) $y = (x - 3)^n$

   (iii) $y = 2x^n$

   (iv) $y = (x + 2)^n - 3$

   (v) $y = -x^n$

Edexcel AS Mathematics Graphs and transformations

4. The graph of $y = \mathrm{h}(x)$ is shown below.
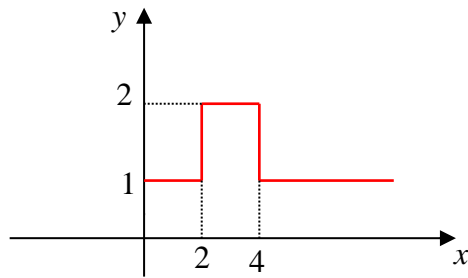
On separate axes draw sketch graphs of the following:
(i) $y = \mathrm{h}(x) + 1$
(ii) $y = 2\mathrm{h}(x)$
(iii) $y = \mathrm{h}(2x)$
(iv) $y = \mathrm{h}(x + 2)$
(v) $y = \mathrm{h}(x - 1)$
(vi) $y = \mathrm{h}(-x)$

5. Sketch each of the following pairs of curves on the same axes.
(i) $y = \cos x$ and $y = -2\cos x$
(ii) $y = \sin x$ and $y = \sin(x + 90°)$
(iii) $y = \tan x$ and $y = \tan\left(\tfrac{1}{2}x\right)$

6. Sketch each of the following curves, showing the asymptotes and the points where the curves cross the coordinate axes.
(i) $y = \dfrac{1}{x - 1}$

(ii) $y = \dfrac{1}{x} + 2$

(iii) $y = -\dfrac{1}{x^2}$

(iv) $y = \dfrac{1}{(x + 2)^2}$