

Transformations of Graphs Part 2 KS4 Higher and Revision for Year 12

1. The graph below, shows a sketch of the curve with equation $y = f(x)$.

The minimum point of the curve is A (2, -1).

- (a) Write down the coordinates of the minimum point of the curve with equation:

(i) $y = 2f(x)$ (ii) $y = f(x) + 1$ (iii) $y = f(x - 3)$ (iv) $y = f(2x)$

(v) $y = f(x + 4) - 3$ * (vi) $y = f\left(\frac{1}{2}x\right)$ * (vii) $y = f\left(\frac{3}{2}x\right)$

* (viii) $y = f(-x)$

Note: “ * = challenging ”

- (b) The curve $y = f(x)$ is reflected in the $x - axis$.

- (i) Write down the coordinates of the point that corresponds to the minimum point, A.

- (ii) Write down the equation of the curve following this reflection in terms of (x) .

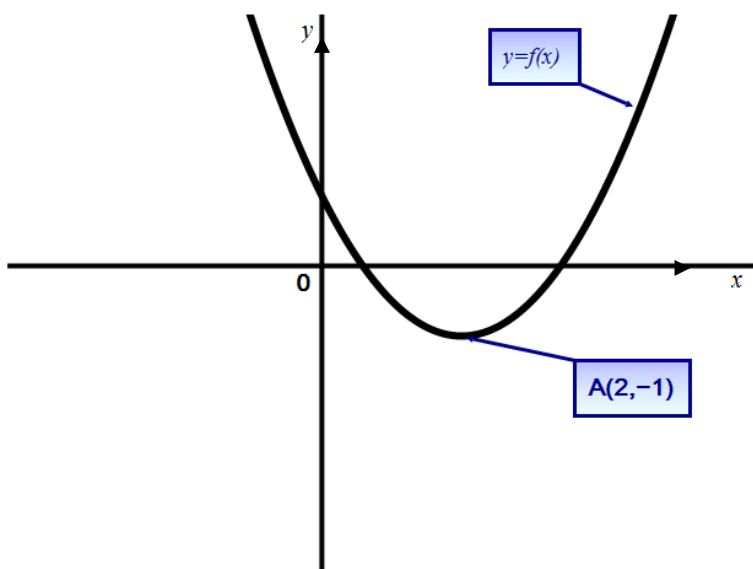
- (c) The curve $y = f(x)$ is reflected in the $y - axis$.

- (i) Write down the coordinates of the points that correspond to the minimum point A.

- (ii) Write down the equation of the curve following this reflection in terms of $f(x)$.

- (d) The curve with equation $y = x^2$ has been translated to give the curve $y = f(x)$.

Find the equation of $f(x)$ in terms of x .



2. The graph below, shows a sketch of the curve with equation $y = f(x)$.
 The curve cuts the y - axis at the point A(0, 4) and the x - axis at B(2,0) and C(-1,0).
 (a) Write down the coordinates of the points that correspond to the points A, B and C of the curve with equation:

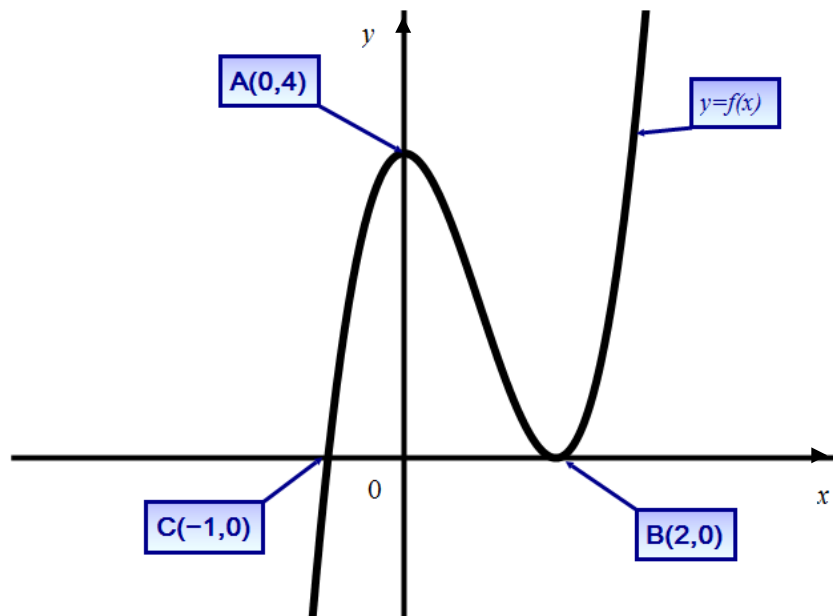
(i) $y = 2f(x)$ (ii) $y = f(x) + 1$ (iii) $y = f(x + 2)$ (iv) $y = f(2x)$

(v) $y = f(x - 4) - 3$ * (vi) $y = f\left(\frac{1}{2}x\right)$ * (vii) $y = f\left(\frac{3}{2}x\right)$

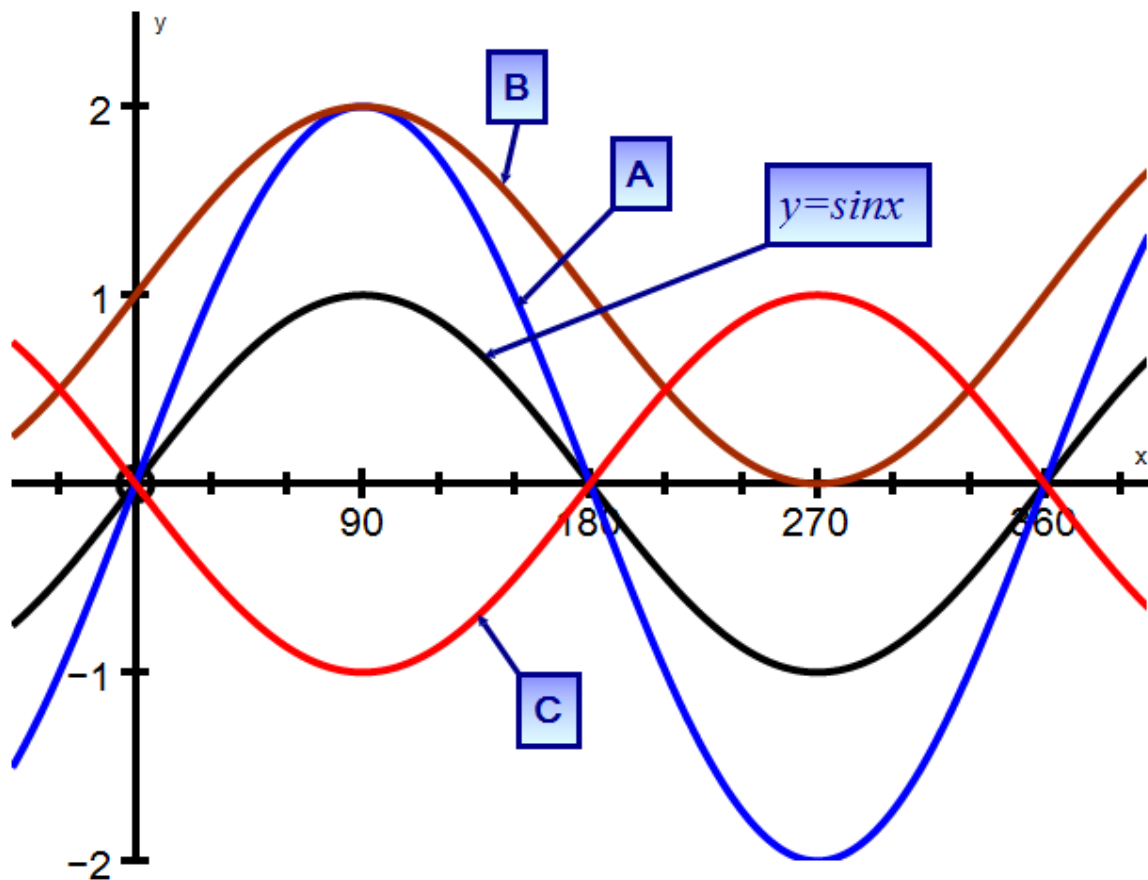
* (viii) $y = f(-x)$

Note: “ * = challenging”

- (b) The curve $y = f(x)$ is reflected in the x - axis.
 (i) Write down the coordinates of the points that correspond to the points A, B and C.
 (ii) Write down the equation of the curve following this reflection in terms of $f(x)$.
- (c) The curve $y = f(x)$ is reflected in the y - axis.
 (i) Write down the coordinates of the points that correspond to the points A, B and C.
 (ii) Write down the equation of the curve following this reflection in terms of $f(x)$.

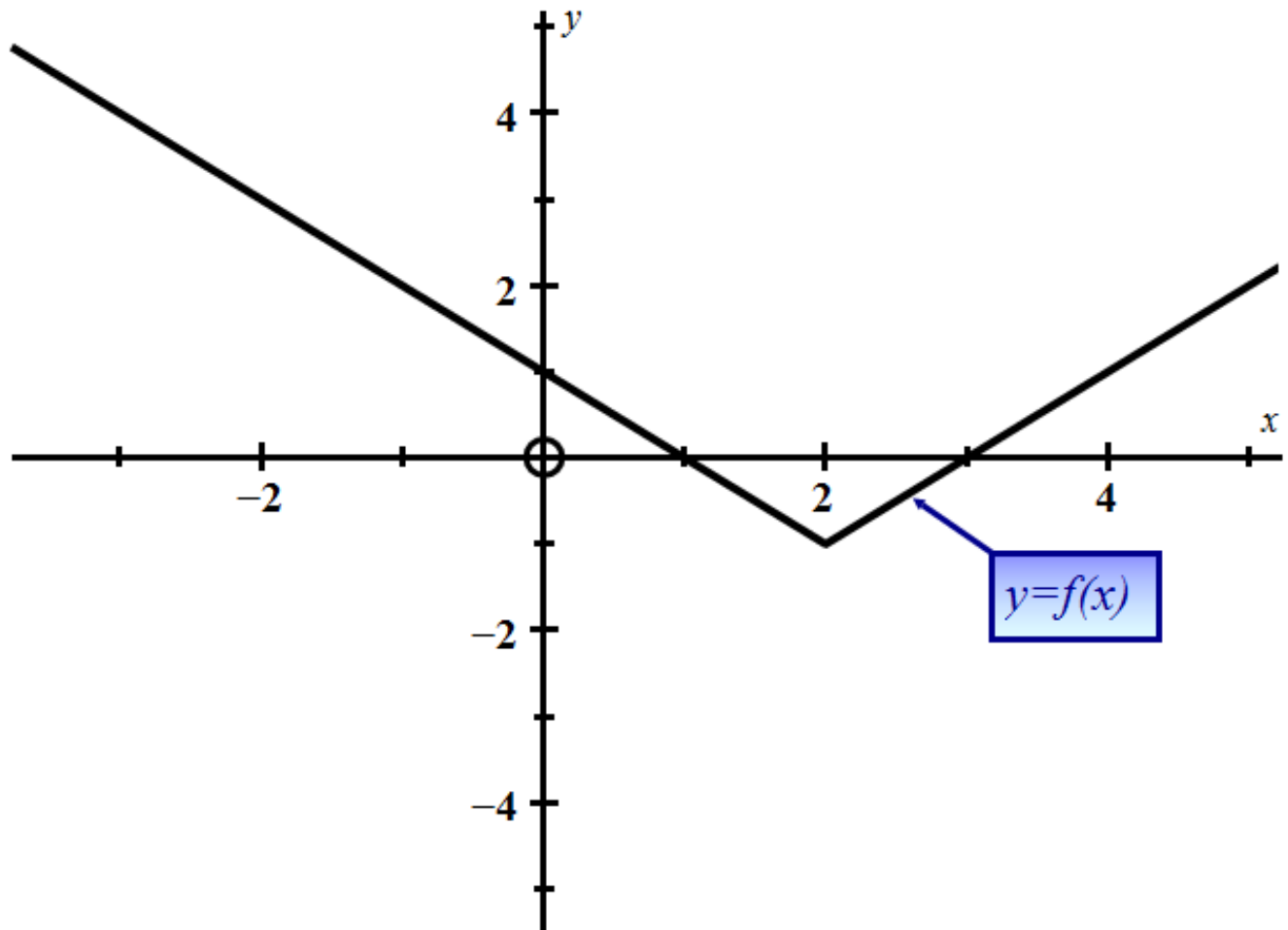


3. (a) The sketch of $y = \sin x$ is shown below. Curves A, B and C are transformations of $y = \sin x$.
Using the sketch of $y = \sin x$ or otherwise, find the equations of the curves A, B and C.
- (b) Describe fully the sequence of the two transformations that would map the graph of $y = \sin x$ onto the graph of $y = 4\sin 3x$.



4. The graph below, shows a sketch of $y = f(x)$. On the same diagram, draw the sketch of:

(a) $y = 2 + f(x - 1)$ (b) $y = f(2x)$ (c) $y = 2f(x + 3) - 3$



5. Describe the transformation that maps the graph of $y = f(x)$ onto each of the following:
(a sequence of transformations is required in (h) below)

(a) $y = 2 + f(x)$ (b) $y = f(2x)$ (c) $y = f(x + 2)$,

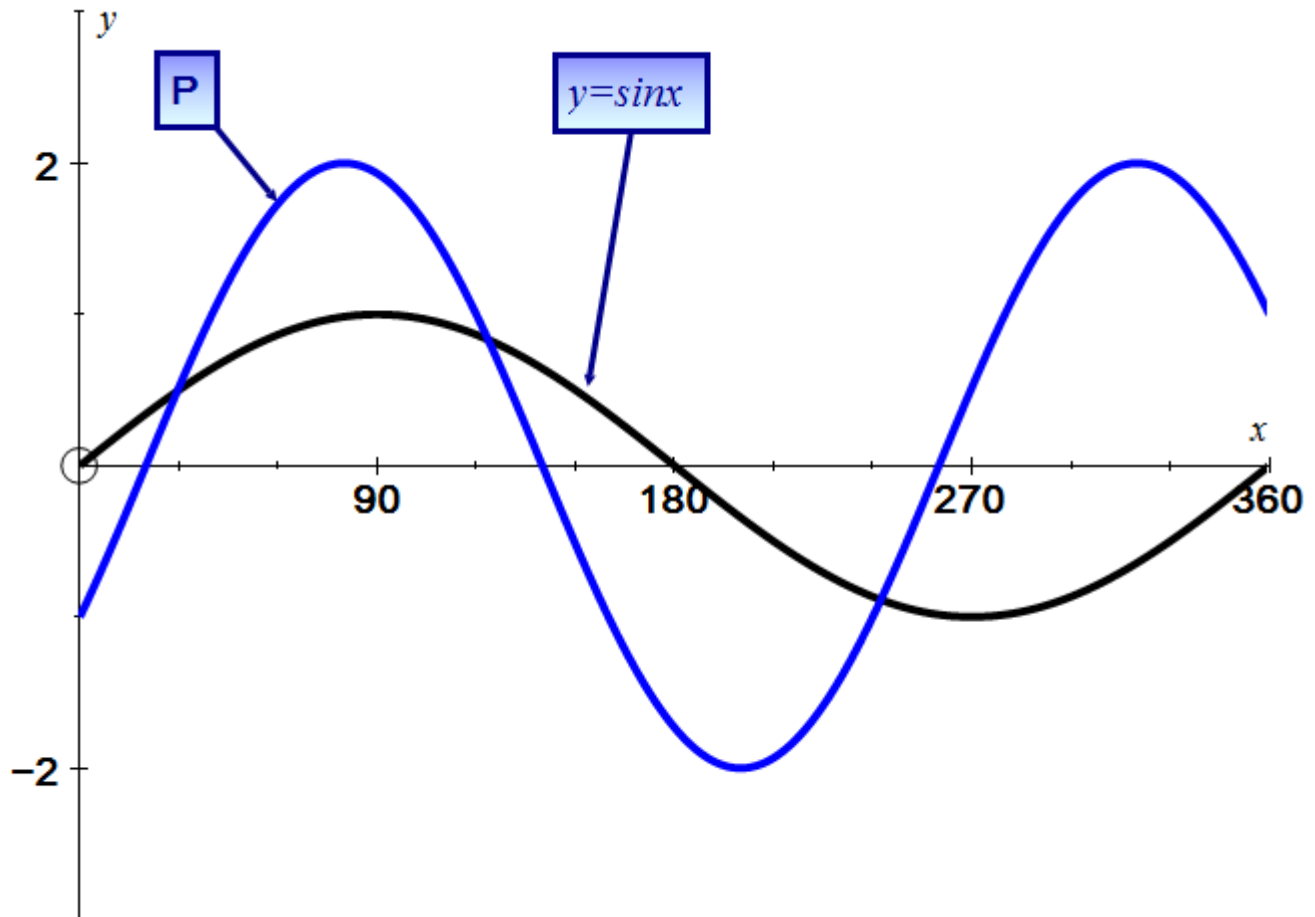
(d) $y = f(x - 2)$ (e) $y = 2f(x)$ (f) $y = -f(x)$

* (g) $y = f(-x)$ (h) $y = 2f(x - 3) + 1$ (i) $y = f(0.5x)$

* (j) $y = f(1.5x)$

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6. The graph of $y = f(x) = \sin x$ has been transformed to the graph, P, shown below.
Find the equation of the curve P in terms of: (i) $f(x)$ (ii) $\sin x$



Answers:

1. (a) (i) (2,-2) (ii) (2,0) (iii) (5,-1) (iv) (1,-1)
(v) (-2,-4) (vi) (-4,-1) (vii) $(1\frac{1}{3}, -1)$ (viii) (-2,-1)

(b) (i) (2,1) (ii) $y = -f(x)$

(c) (i) (-2,-1) (ii) $y = f(-x)$

(d) $y = (x - 2)^2 - 1$ or $y = x^2 - 4x + 3$

2. (a) (i) A(0,8) B(2,0) C(-1,0)

(ii) A(0,5) B(2,1) C(-1,1)

(iii) A(-2,4) B(0,0) C(-3,0)

(iv) A(0,4) B(1,0) $C(-\frac{1}{2}, 0)$

(v) A(4,1) B(6,-3) C(3,-3)

(vi) A(0,4) B(4,0) C(-2,0)

(vii) A(0,4) $B(1\frac{1}{3}, 1)$ $C(-\frac{2}{3}, 0)$

(viii) A(0,4) B(-2,0) C(1,0)

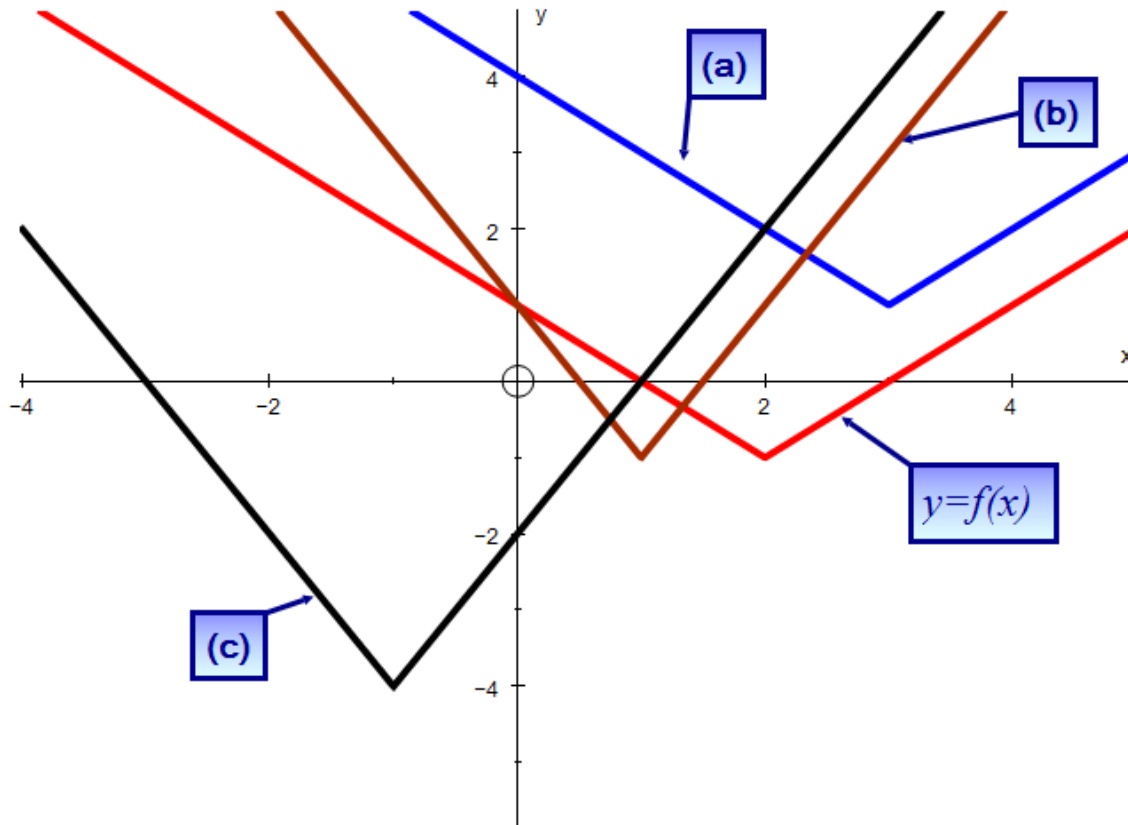
- (c) (i) A(0,4) B(-2,0) C(1,0)

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

3. (a) A: $y = 2\sin x$ B: $y = 1 + \sin x$ C: $y = -\sin x$

- (b) Stretch parallel to y-axis scale factor 4, stretch parallel to x-axis scale factor $\frac{1}{3}$

4.



5. (a) Translation vector $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$ (b) Stretch s.f $\frac{1}{2}$ parallel to the x -axis (c) translation vector $\begin{pmatrix} -2 \\ 0 \end{pmatrix}$

(d) translation vector $\begin{pmatrix} 2 \\ 0 \end{pmatrix}$ (e) Stretch s.f 2 parallel to the y -axis (f) reflection in the x -axis

(g) reflection in the y -axis

(h) translation vector $\begin{pmatrix} 3 \\ 0 \end{pmatrix}$, stretch s.f 2 parallel to the y -axis, translation vector $\begin{pmatrix} 0 \\ 1 \end{pmatrix}$

(i) stretch s.f 2 parallel to the x -axis (j) stretch s.f $\frac{2}{3}$ parallel to the x -axis

** 6. (i) $y = 2f(1.5x - 30^\circ)$ (ii) $y = 2\sin(1.5x - 30^\circ)$

I hope you find this worksheet useful. If you find any errors, please let me know. Thank you.