PRACTICE 3.3 – Transforming Functions

In words, describe the transformation that has been made to the parent quadratic y = x^2 in each function given below.

1	**a**	$y=(x-3)^2$	**b**	$y=(x+4)^2$	**c**	$y=(x-h)^2$
2	**a**	$y=x^2+1$	**b**	$y=x^2-2$	**c**	$y=x^2+k$
3	**a**	$y=-x^2$	**b**	$y=2x^2$	**c**	$y=\frac{1}{3}x^2$
	d	$y=-3x^2$	**e**	$y=ax^2$		
4	**a**	$y=(x+4)^2-2$	**b**	$y=2(x-3)^2$	**c**	$y=-\frac{1}{2}x^2+4$
	d	$y=3(x-2)^2-4$	**e**	$y=a(x-h)^2+k$		

For problem 5, open Desmos and enter: y = a(x – h)^2 + k.
Make "a", "h", and "k" sliders. Investigate the effect of changing these three parameters.

5 **Factual** What effect do a, h and k have in transforming the graph of $y=x^2$ to the graph of $y=a(x-h)^2+k$?

6 Without using your GDC, sketch a graph of $y=x^2$. Then apply the transformations in the order given.

- **a** Vertical stretch with scale factor 2; horizontal translation right 3; vertical translation down 4. Write down the equation of the final graph.
- **b** Horizontal translation right 3; vertical translation down 4; vertical stretch with scale factor 2. Write down the equation of the final graph.

* Full, worked solutions for the Practice Assignments below can be found in the folder linked on the Course Website ☺

Exercise 3J

1 Sketch the parent quadratic, $y = x^2$, and the graph of $y = g(x)$ on the same axes. Then write down the coordinates of the vertex and the equation of the axis of symmetry for the graph of g.

a $g(x) = (x + 3)^2$ **b** $g(x) = -x^2 + 4$

c $g(x) = \frac{1}{4}x^2$ **d** $g(x) = 2(x - 4)^2 - 3$

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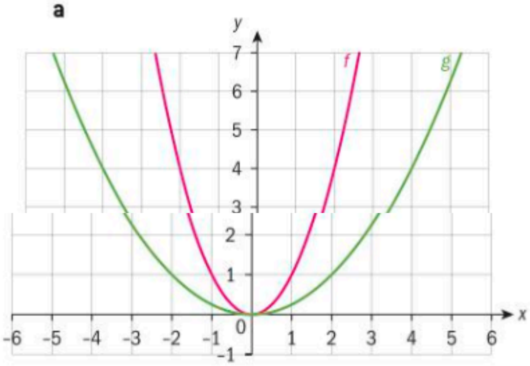
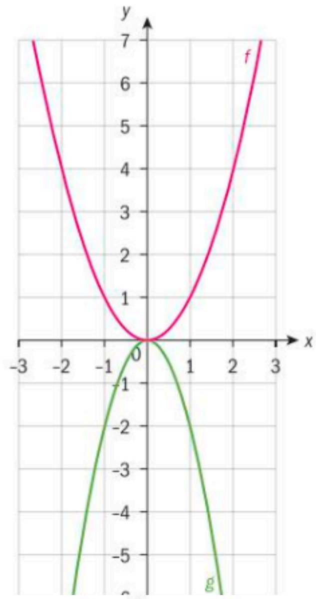
2 Describe the transformations of the graph of $f(x) = x^2$ that lead to the graph of g. Then write an equation for $g(x)$.

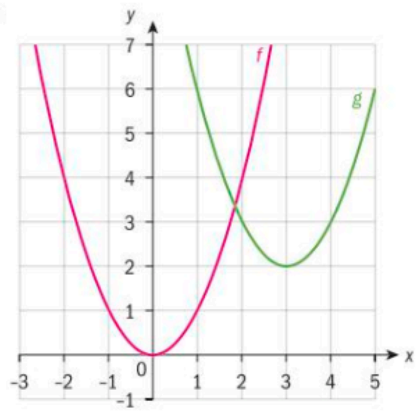
a



b



c



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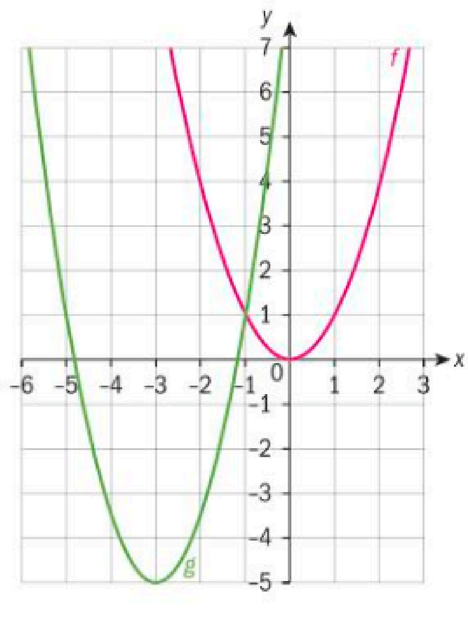

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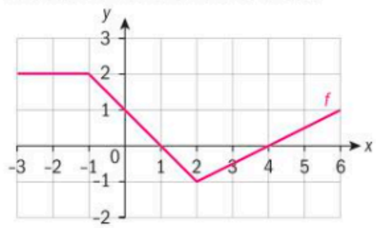
Reflect What is the relationship between the graphs of $y = f(x)$ and $y = f(-x)$?

The graph of $y = f(qx)$ is a horizontal stretch or compression of the graph of $y = f(x)$. For which values of q is the transformation a stretch rather than a compression?

Exercise 3K

1 The graph of $y = f(x)$, where $-3 \le x \le 6$, is shown. Copy the graph of f and draw these functions on the same axes.



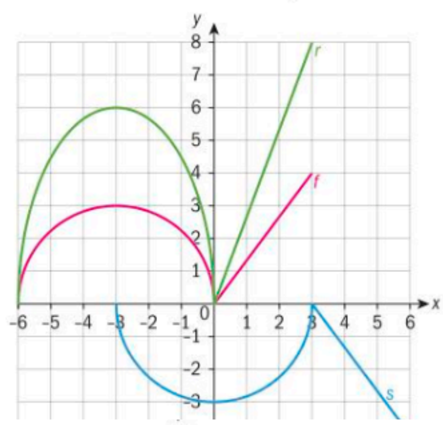
a $g(x) = f(-x)$ **b** $g(x) = -f(x)$

c $g(x) = f(2x)$ **d** $g(x) = 3f(x)$

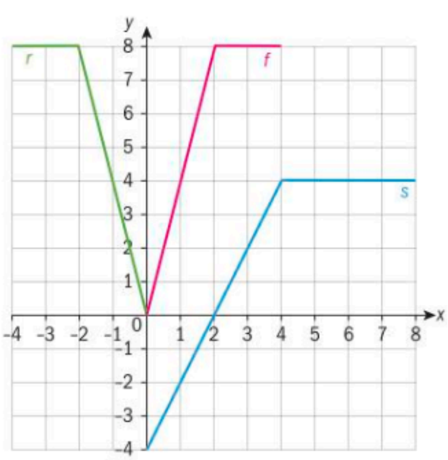
e $g(x) = f(x + 6)$ **f** $g(x) = f(x) - 3$

2 The graphs of functions r and s are transformation of the graph of f. Find the functions r and s in terms of f.

a



b



3 The diagram shows the graph of $y = f(x)$, for $2 \le x \le 8$.

a Write down the range of f.

Let $g(x) = f(-x)$.

b Sketch the graph of g.

c Write down the domain of g.

The graph of h can be obtained by a vertical translation of the graph of g. The range of h is $-4 \le y \le 2$.

d Find the equation for h in terms of g.

e Find the equation for h in terms of f.