

## Chapter notes: 6 Transformations of graphs

### Overview

*The ideas in this chapter will be applied to trigonometric functions in section 9E, and to integration in Section 20B. Some of the examples use exponent and log functions from chapter 2. It requires approximately three hours of teaching time.*

### Introductory problem

This problem should encourage students to think about graphs simply as a set of connected points. The worked solution is given at the end of the chapter, page 184; the idea being that students should be able to answer the question using the methods covered in the chapter.

### 6A, B, C Translations, stretches and reflections, p155

The use of colour in the equations should help with the common misunderstanding, when dealing with two equations for graphs, that the variables are ‘equal’ in both equations.

There are three skills which the students should be able to do:

1. From a transformation, draw a new graph.
2. From a transformation, deduce a change in an expression.
3. From a change in an expression, deduce a transformation.

These correspond to the three practise questions in each section. Although most students find the third type most difficult, a significant minority have real difficulty in the first type.

### 6D Modulus transformations, p163

Equations involving modulus functions have appeared in examinations in the past. We recommend a graphical approach to solving them, even in the non-calculator paper. Algebraic approaches are not required in the IB.

*Hints for the grade 7 questions:*

10. Sketch both graphs. Do not be put off by the  $q^2$  – it is just there to make sure that this term is positive.
11. Look at the case when  $f(x)$  is positive separately to when it is negative.

### 6E Consecutive transformations, p167

Examination questions mixing vertical and horizontal transformations are relatively rare, so this section does not necessarily need to be explored in detail if there are time constraints.

ERRATA: Question 4 should refer to the function from question 3, not question 1.

### 6F Reciprocal transformations, p174

The main message for this section is to think about graphs as a series of connected points. Many graph-plotting software packages allow animation of the graph-drawing process, which encourages this thought process.



*Hints for the grade 7 questions:*

7. Important points to consider are when  $f(x) = 0$ ,  $g(x) = 0$  and when  $f(x) = g(x)$ .

### **6G Symmetries of graphs and functions, p178**

This topic was introduced in the most recent syllabus update. Although the focus is not even and odd functions, the syllabus allows questions on any simple symmetry (as, for example, in question 10).

*Hints for the grade 7 questions:*

10. Try a few values of  $x$ .

11. Make a link with inverse functions.