Transformation... or not?

Teacher notes

Why use this resource?

Students are encouraged to think about the properties of trigonometric functions and their graphs. They will hopefully recognise the periodicity and shape of this graph as a property of the sine or cosine function but will need to consider how each can be transformed to create the given graph.

The task also explores how a transformed sine function can be written as the sum of a sine and a cosine.

Preparation

You may want to use the supplied GeoGebra document or something similar to match up suggested functions with the given graph.

If available, students could be allowed to use graphing calculators or software.

Possible approach

This problem could be tackled using graphing software, either as a plenary activity showing students' suggested functions, or with each student having access to the software. The supplied GeoGebra document has the main problem graph as a background image.

The further questions then provide an opportunity for students to apply their findings to find functions that can represent three further graphs. If GeoGebra is used for the initial problem, it might be nice to tackle the follow up questions on paper, perhaps using GeoGebra as a whole-class tool for checking / comparing suggested solutions from students.

You might use the initial problem to review students' understanding of transformations of sine graphs before going on to explore how this can also be written as a sum of sine and cosine functions.

Key questions

- What are the domain and range of the function?
- What is the period of this function?
- What is the amplitude of this function?
- How do these compare to other functions you know?
- How many ways can you find to create this graph?

Possible support

Students might sketch the basic trigonometric graphs and some simple transformations to start them thinking about how changes may be effected.

Possible extension

(For the Further questions section)

- Can you form an identity using your values of A and B and your single transformations.
- Can you generalise these?

A version of this resource has been featured on the NRICH website. You might like to look at some students' solutions that have been submitted there.