# Curvy cubics

Teacher notes

## Why use this resource?

This resource asks the big question *What gives a cubic curve its curves?*. It starts by showing four graphs of cubic functions, each with somewhat differnet features. Students are asked to find an equation for each cubic.

The students are then asked to explain why calculus might be able to help determine the type of *curves* a cubic function has and find out why the fourth cubic looks like it does - thus giving a way of determining a possible equation for it.

## Preparation

It may be helpful for students to have a printout of the problem page so that they can use the grid to note points on each graph. The graphs should be distinguishable in grey scale printing and are labelled.

## Possible approach

You could start directly by asking students to work to try to find an equation for each. This could follow a "think, pair, share" model. Alternatively, to focus students attention on the features of the graphs, you could start zoomed in on the image and either ask students to "say what you see" or choose any pair of curves and comment on "what's the same and what's different". In both cases, this could contribute to a discussion of the big question *What gives a cubic curve its curves?* which could be returned to later.

The later sections of the resource suggest ways of finding equations for each curve. Curve $C$, which does not have any stationary points, may be unfamiliar if students are just relying on looking at the roots of a cubic polynomial defining the curve. Therefore they will need to consider how calculus can help them.

## Key questions

- Do these curves share any features with cubics that you know about already?
- What types of stationary points do the curves have?
- How does the gradient function behave in each case?
- (After equations have been found) What would the derivative of this function look like and what does that tell us about the shape of the curve?

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.