Name that graph again

Teacher notes

Why use this resource?

This problem is closely linked to Name that graph.

Students are invited to find an equation for a parabola, that has no x-intercepts, given three coordinate points. Students should be encouraged to take an approach of their choice before reflecting on whether this is the only way to find an equation or indeed the most efficient way. This is a lovely example of a practical use for transformations of graphs and keeping track of notation as students work through a problem.

The resource is also accompanied by some Student starting points which can be used to encourage students to explore different ways of thinking.

Preparation

Depending on the approach taken, printouts of the Student starting points that can be annotated and worked from could be useful.

Possible approaches

Students could start working individually or in pairs thinking about approaches to the problem. A two minute individual think, two minute paired confer could be used. The class might then plenary and each pair would decide on their approach and proceed with it.

Alternatively students could proceed without a class plenary, teachers might like to nudge students in different directions, especially if they are struggling to start.

A final class plenary bringing together the equations in different forms could be used, or if time allowed students could be encouraged to try again using a different approach and check their equations are similar.

Another alternative would be to allocate approaches (using the Student starting points) to student pairs evenly and then have them work in groups working from different starting points to find an agreed final equation.

Key questions

To elicit some different approaches might be:

- Can you sketch a parabola that you could more easily write an equation for?
- What do we know already about other points on the parabola?
- What form of equation could a parabola have?

If using the Student starting points:

- What is this student doing?
- Why are they doing that?
- What could they do next?

Possible support

Students could be shown the *Have you thought about...* section, or this could be shown in plenary if students have not suggested this idea.

Possible extension

Pairs could come up with a different set of information for each other or another pair to try.

The approach taken by student 4 in Student starting points is more unusual. It is based on an assumption that the gradient of the straight line joining two points on the parabola is equal to the gradient of the parabola at the midpoint between these two points. Inviting students to analyse this starting point and attempt to complete the work is a more challenging task that requires them to know that an expression for the gradient of a parabola can be found by differentiating. Asking them to think about and try to justify why the original assumption is valid is also an important part of this.

These ideas are connected to Parabella.

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.