

### Why use this resource?

An exploration of the graphs of powers of  $x$  and related functions this problem should be attempted initially without graphing software which can be used later as an effective tool for checking answers and for attempting the final questions, allowing students to get a feel for how to make subtle changes to a graph by editing its equation. This is an early opportunity for students to notice pervasive ideas in maths: in particular here the idea of [averages](#) in the context of curves or equations may be intuitively obvious to some and alien to others.

Further reflections on behaviour of functions and how this affects algebraic manipulation may be prompted by the resource [Inequality flip-flop](#)

### Preparation

- You may want to print out copies of the graph for the students.
- You will probably want the graph displayed on the board.
- You may want access to graphing software or calculators.

### Possible approach

Display the graph and ask students to identify which curves they know. (This could be done without the functions at first.) In pairs or small groups, with access to the functions, check their answers and complete the labelling.

Now work on the remaining two tasks.

### Key questions

- Can you see any connection between  $y = x^2$  and  $y = \sqrt{x}$
- Do the co-ordinates of points on the graph help you?
- Why should  $y = \frac{(x^2+x)}{2}$  lie between  $y = x^2$  and  $y = x$ ?

### Possible support

Students really struggling to visualise or sketch curves could have access to graphing software.

### Possible extension

There is plenty of scope for extension in discovering curves that fit the criteria for the two investigatory questions