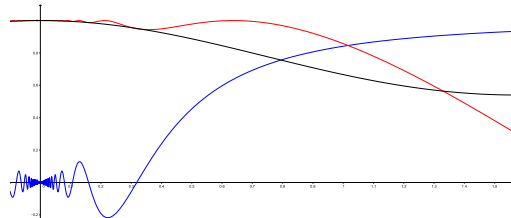


## Year 13 Advanced mathematics problems/STEP course 2021.

The graphs of  $y = x \sin\left(\frac{1}{x}\right)$ ,  $y = \cos\left(x \cos\left(\frac{1}{x}\right)\right)$  and  $y = \cos(\sin(x))$  are shown below. Which is which?



### Course aims and description

This course is in two parts:

**Part 1** consists of seven year 13 problems classes each of 1.5 hours duration scheduled on Saturdays between September and November. The course is suitable for students who intend at the present time to either pursue an undergraduate degree in a mathematical subject, sit one of the STEP examinations in summer 2020 or who just have a passion for mathematical problem solving.

**Part 2** consists of ten STEP preparation classes of two hours duration (except for the last two which are 3 hours) scheduled between January and May 2020. There will be a preliminary problem sheet on **Algebra** which will be emailed to participants early January with submission of solutions required by the February 24 class. The course is suitable for students who have an offer to study undergraduate mathematics which requires STEP grades.

Participating students are expected to solve challenging problems in class on whiteboards and to attend regularly. The course is free for all year 13 students. To apply for places on either part of the course or for further enquiries contact: [mathsor@le.ac.uk](mailto:mathsor@le.ac.uk)

The topics and timings for the classes are given in the table below. Participating students will be informed of the room venues, all of which will be in the main university campus on University Road, Leicester.

### The course schedule

| Class topic(s)   | Date                      |
|--|---------------------------|
| Algebra  | Mon Jan 11 : 4.30 to 6 pm |
| Trigonometry   | Mon Jan 25: 4.30 to 6 pm  |
| Calculus   | Mon Feb 8: 4.30 to 6 pm   |
| Curve Sketching  | Mon Feb 22: 4.30 to 6 pm  |
| Proof  | Mon Mar 8: 4.30 to 6 pm   |
| Inequalities   | Mon Mar 22: 4.30 to 6 pm  |
| Sequences and Series                                   | Mon Apr 5: 4.30 to 6 pm   |
| STEP Proof   | Apr TBA :TBA              |
| STEP Coordinate Geometry                               | Apr TBA :TBA              |
| STEP Inequalities                                      | Apr TBA :TBA              |
| STEP Calculus  | Apr TBA :TBA              |
| STEP Vectors   | Apr TBA :TBA              |
| STEP Trigonometry                                      | May TBA :TBA              |
| STEP Numbers and Series                                | May TBA :TBA              |
| STEP II Complex Numbers                                | May TBA :TBA              |
| STEP II/III Matrices and the Vector Product            | May TBA :TBA              |
| STEP III Hyperbolic Functions, Further Calculus, Proof | May TBA :TBA              |
| STEP III D.E.'s, Complex Numbers, Polar Coordinates    | May TBA :TBA              |