Graphs & transformations (AS)

B7   Understand and use graphs of functions; sketch curves defined by simple equations including polynomials, $y = \frac{a}{x}$ and $y = \frac{a}{x^2}$ (including their vertical and horizontal asymptotes); interpret algebraic solution of equations graphically; use intersection points of graphs to solve equations. Understand and use proportional relationships and their graphs.

B9   Understand the effect of simple transformations on the graph of $y = f(x)$ including sketching associated graphs: $y = a\,f(x)$, $y = f(x) + a$, $y = f(x + a)$, $y = f(ax)$

For a brief commentary on this content go to the MEI outline SoW.

Pre-requisites

- GCSE: Familiarity with reciprocal graphs and transformations of quadratic graphs.
- AS Quadratic equations and graphs: General properties of quadratic graphs.
- AS Polynomials: General properties of graphs of polynomials.
- AS Trigonometry: General properties of trigonometric graphs.

Common student errors

- Misunderstanding transformations parallel to the x-axis. For example, thinking that $f(x + 4)$ is a shift of 4 units in the positive x-direction, or that $f(ax)$ is a stretch of scale-factor a in the x-direction.
- A lack of appreciation of the difference between a sketch and a plot. In particular, where the x-axis is an asymptote, such as for $y = \frac{1}{x-2}$, incorrectly continuing their 'decreasing curve' down below the x-axis.

Teaching it!

- A series of nine videos designed to support students on this topic.
- Understanding transformations: Activity based on graphs of non-standard functions (Solution).
- Card sort: Transformations A Desmos Classroom activity matching transformed graphs to expressions.
- Graph transforms: A selection of easy-to-use activities and a PPT display from Don Steward.
- Transforming Trig Functions: A GeoGebra file illustrating transformations of trig graphs.
- Transformations of functions (student task): Autograph, Casio, Desmos, GeoGebra
- Transformations of $y = \frac{k}{x}$ graphs (student task): Autograph, Desmos

Getting them thinking

- Sketch and explain the important features of the graph $y = x + \frac{1}{x}$.
- What is the same and what is different about the graphs of $y = x^2 + \frac{1}{x^2}$ and $y = x^2 - \frac{1}{x^2}$?
- Prove that the graph of $y = x^3 + \frac{2}{x}$ has rotational symmetry about the origin.