# TECHNOLOGICAL ENVIRONMENTS

- What algebraic insights and 'symbol sense' does the user of a computer algebra system need and what insights does the use of the systems bring ?
- A strength of computer algebra systems is that they support multiple representations of mathematical concepts. How can this be used well ? Might it be over-used ?
- What are the relationships and interactions between different approaches and philosophies of mathematics teaching with the use of computer algebra systems ?
- Students using different computational tools solve problems and think about concepts differently. Teachers have more options for how they teach. What impact does this have on teaching and learning ? Which types of system support which kinds of learning ? Can these differences be characterised theoretically ?
- What should an algebra curriculum look like in a country where computer algebra systems are freely available ? What 'by hand' skills should be retained ?

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Recent research, curriculum development, and classroom practice have incorporated a number of technologies to help students develop meaning for various algebraic objects, ideas and processes. These include, but are not limited to, function graphers, spreadsheets, programming languages, one-line programming on calculators, and other specific computer software environments. [Here, we exclude computer algebra systems that are treated elsewhere.] In an attempt to characterise recent research and experience, this section will explore which aspects of specific computer/calculator environments are related to which kinds of algebra learning. This question will be explored in depth for specific examples of such technology, by addressing questions such as the following :

- For a given technological environment, what are the implicit assumptions regarding the underlying core aspects of algebra ?
- Which important aspects of algebra are and are not touched upon by this environment ?
- What kinds of algebra learning does this environment promote ?
- What particular limitations are associated with the use of this environment and how can such limitations be dealt with ?
- To what extent ought the goals of algebra education be affected by the availability of this technology ?
- To which aspects of algebra learning does this particular technology make a distinctive, unique contribution ?
- Are there documented long-term consequences of embedding this particular technology in an algebra curriculum, and if so, what are they ?

Submissions for this section should include discussion of as many of the above sub-questions as possible, but with particular attention paid to the first two items above.