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Mathematics  
Education  
Innovation

Over 50 years  
at the forefront  
of Mathematics  
Education

**CASIO**®



# Student tasks for integrating technology into the new maths A levels

Tom Button

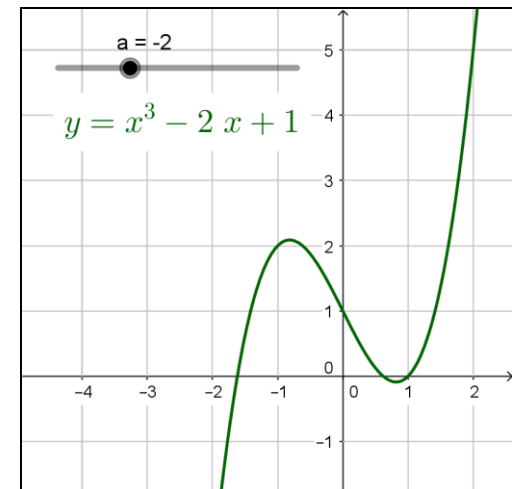
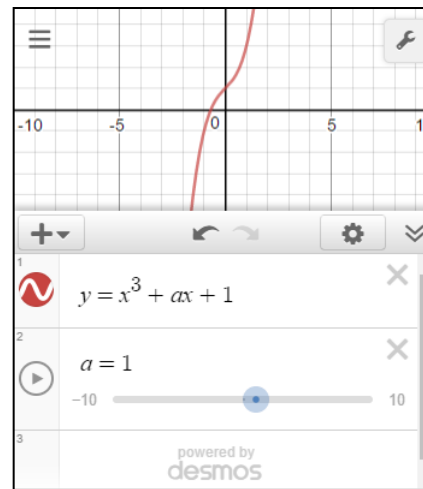
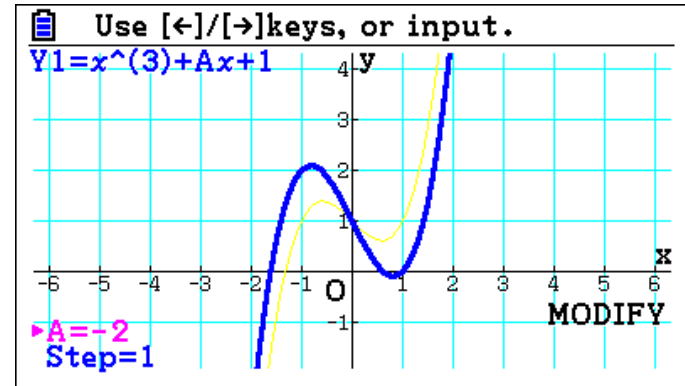
[tom.button@mei.org.uk](mailto:tom.button@mei.org.uk)

# Starter activity

Plot the graph of  

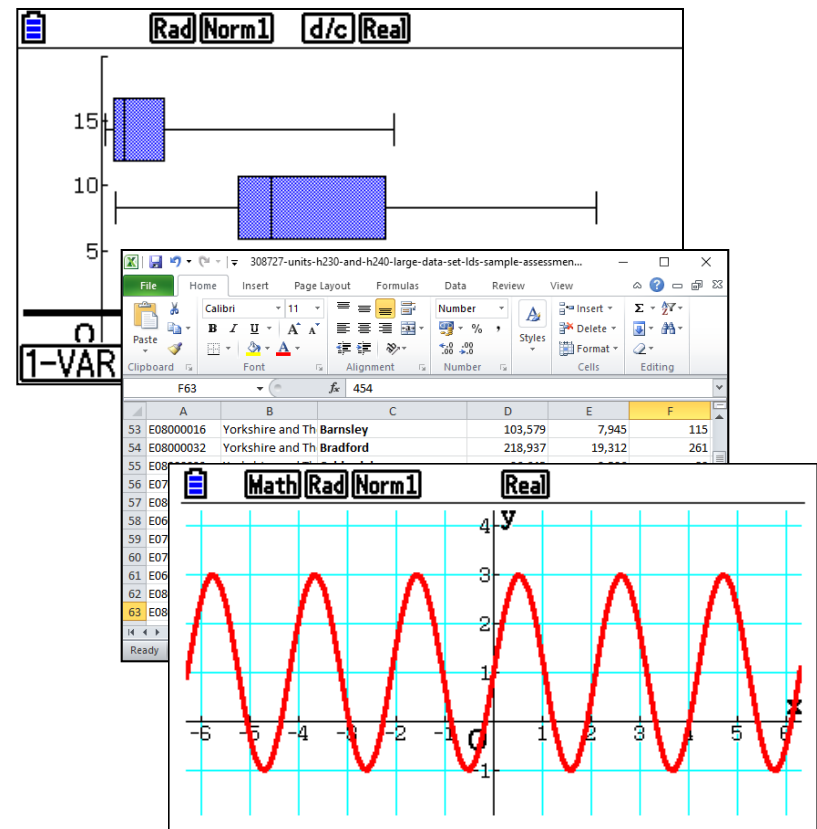
$$y = x^3 + ax + 1$$

What questions can  
 you ask about this  
 function?



# Ofqual guidance for awarding organisations

***“The use of technology, in particular mathematical and statistical graphing tools and spreadsheets, must permeate the study of AS and A level mathematics.”***



# Classroom tasks

A series of tasks, each in 4 parts:

- Construction
- Exploration
- Question
- Extension

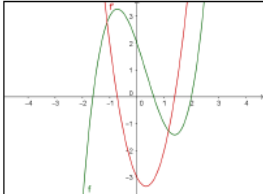
Available for:

- Casio
- Desmos
- GeoGebra

**MEI GeoGebra Tasks for AS Pure**

**Task 6: Differentiation – Exploring the gradient on a curve**

1. In the input bar enter a cubic function: e.g.  $f(x)=x^3-x^2-3x+2$
2. Plot the gradient function by entering  $f'(x)$  in the input bar.

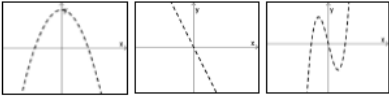


**Question for discussion**

- How is the shape of the gradient graph related to the shape of the original graph? Verify your comments by trying some other functions for  $f(x)$ .

**Problem**

Change your function in GeoGebra so that it has the following gradient functions:



**Extension Task**

Find the point on the function  $f(x) = x^3 - 6x^2 + 9x - 1$  where the tangent has its maximum downwards slope. Investigate the point with maximum downwards slope for other cubic functions.

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Find the point on the function  $f(x) = x^3 - 6x^2 + 9x - 1$  where the tangent has its maximum downwards slope. Investigate the point with maximum downwards slope for other cubic functions.

**MEI** Innovators in Mathematics Education [mei.org.uk/integrating-technology](http://mei.org.uk/integrating-technology) TB v1.2 © MEI 20/03/2017

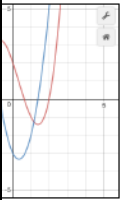
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**AS Pure**


**the gradient on a curve**

click or use the dial  
press = max = dial




shape of the gradient graph?  
 $f'(x)$ .

one of the following graphs:



of the tangent to the

following graphs:



graph

The derivative is in

graph

of the tangent to the

following graphs:

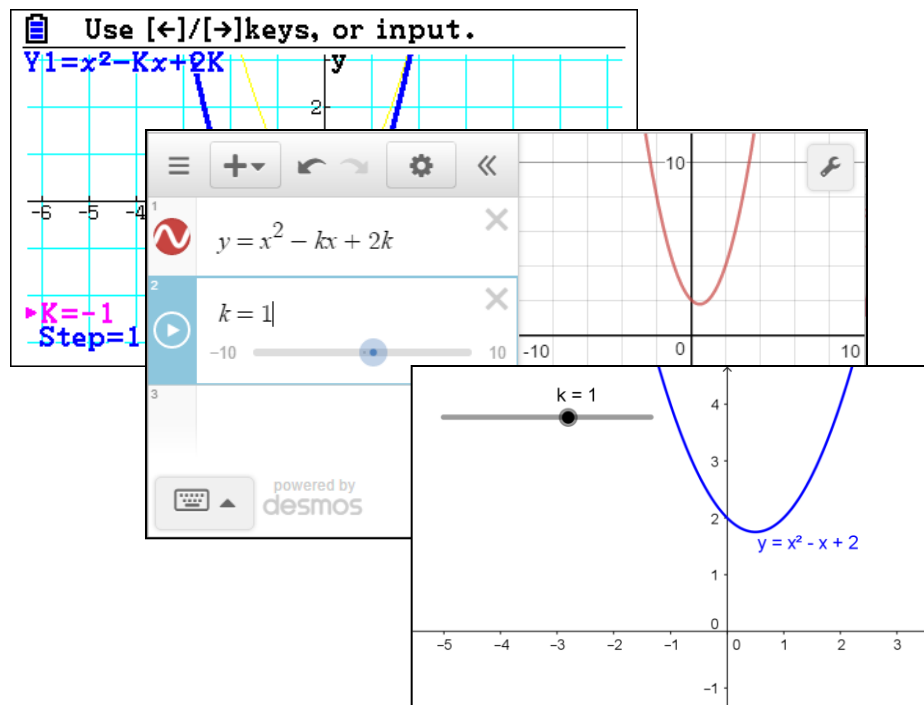
# SAM question (MEI paper 1)

Determine the values of  $k$  for which part of the graph of  $y = x^2 - kx + 2k$  appears below the  $x$ -axis. [4]

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**Would students who have used graphing technology during their study be better prepared for this question?**



# Resources

The screenshot shows the MEI website with a navigation menu and a main content area. The main content area is titled "Integrating Technology Into Your Scheme of Work" and includes a table of suggested resource activities and other technology tasks for various units.

Unit	Suggested resource activity from MEI schemes of work	Other technology tasks
0 Problem solving (AS)	Problem-solving with Geogebra	GeoGebra Construction Problems
1 Surds and Indices (AS)	Summation Power Maze	
2 Quadratic functions (AS)	Enter $y=ax^2+bx+c$ into a graph plotter and vary $a$ , $b$ and $c$ .	Graphs of quadratic functions (Desmos) Graphs of quadratic functions (GeoGebra)
3 Equations and inequalities (AS)	Intersection of a line and a curve	Intersection of a line and a curve (GeoGebra) Quadratic inequalities (GeoGebra) Intersection of a line and a curve (GeoGebra) Quadratic inequalities (GeoGebra)
4 Coordinate geometry (AS)	Equation of a circle	Coordinate Geometry (Autograph) Perpendicular lines (GeoGebra) Equations of circles (Desmos) Perpendicular lines (GeoGebra) Solution of trig equations (GeoGebra)

[mei.org.uk/integrating-technology](https://mei.org.uk/integrating-technology)

- [mei.org.uk/casio-networks](https://mei.org.uk/casio-networks)
- [mei.org.uk/desmos-tasks](https://mei.org.uk/desmos-tasks)
- [mei.org.uk/geogebra-tasks](https://mei.org.uk/geogebra-tasks)



# About MEI

- Registered charity committed to improving mathematics education
- Independent UK curriculum development body
- We offer continuing professional development courses, provide specialist tuition for students and work with employers to enhance mathematical skills in the workplace
- We also pioneer the development of innovative teaching and learning resources