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**2018**

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# Student tasks for integrating technology in A level Maths

**Tom Button**

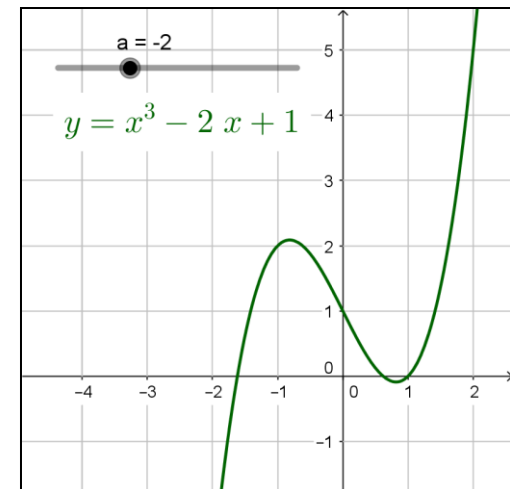
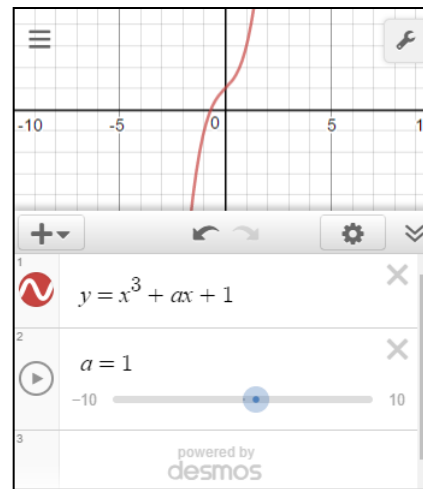
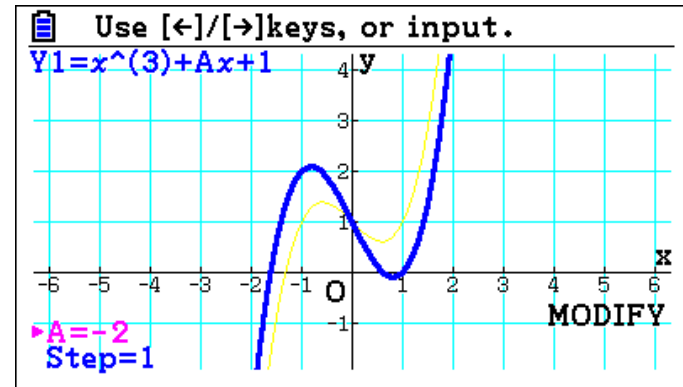
[tom.button@mei.org.uk](mailto:tom.button@mei.org.uk)  
[@mathstechnology](https://twitter.com/mathstechnology)

# Starter activity

Plot the graph of

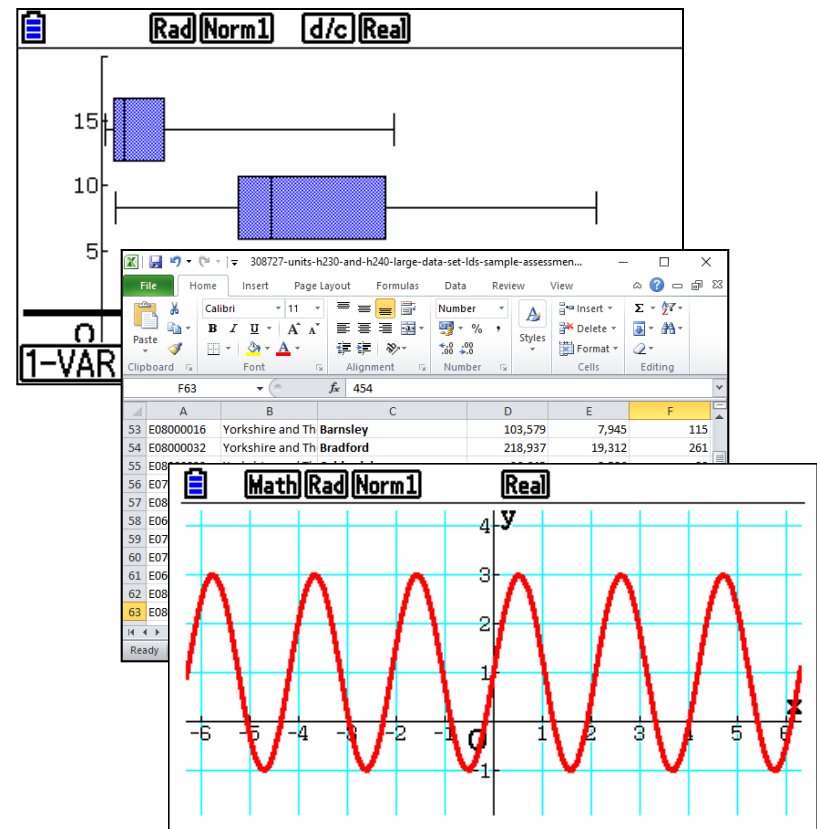
$$y = x^3 + ax + 1$$

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

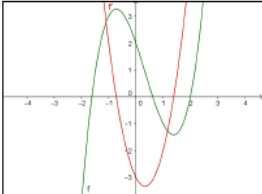
Available for:

- 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.



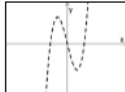


**Question for discussion**

- 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**

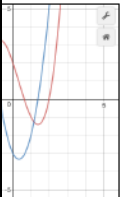
Find the point on the function  $f(x) = x^3 - 6x^2 + 9x - 1$  where the tangent has its maximum downwards slope. Investigate the point with maximum downwards slope for other cubic functions.

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**AS Pure**

**the gradient on a curve**

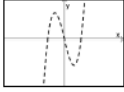
Click or use the dial  
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What is the shape of the gradient graph?

$f'(x)$ .

Draw one of the following graphs:



What is the equation of the tangent to the following graph:



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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.

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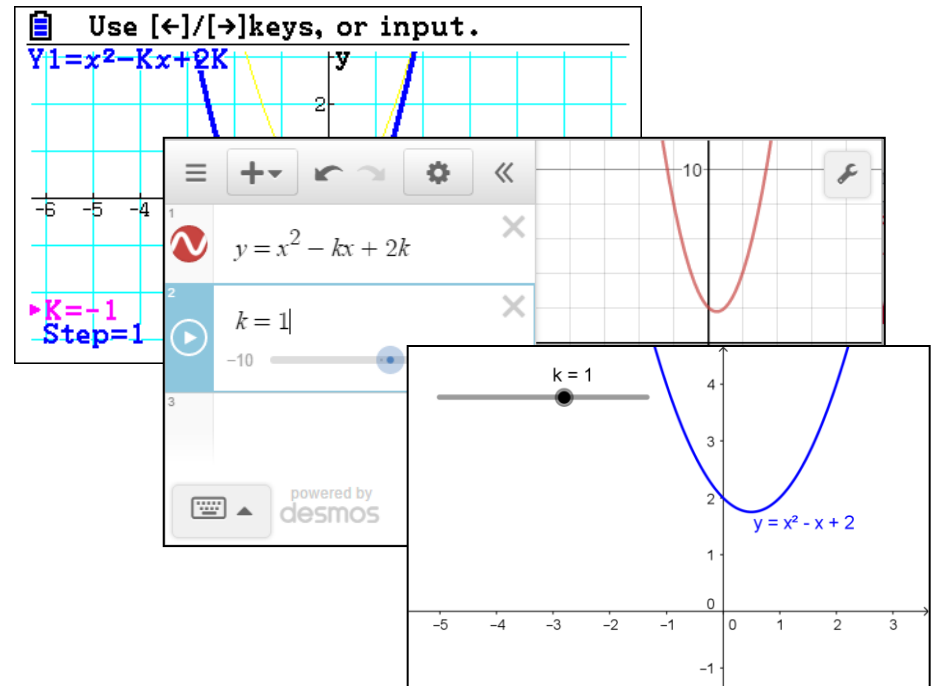
Find the point on the function  $y = x^3 - 6x^2 + 9x - 1$  where the tangent has its maximum downwards slope. Investigate the point with maximum downwards slope for other cubic functions.

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# 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]

**How does using graphing technology during their study better prepare students for this question?**



# Resources

**MEI** Innovators in Mathematics Education  
Mathematics in Education and Industry  
01225 756 776

Home » Teachers » Use of Technology » Integrating technology into Your Scheme of Work

### Integrating Technology Into Your Scheme of Work

The table below gives ideas for integrating technology into your scheme of work for AS/A level Mathematics (first teaching September 2017). The sections in this table are based on the new MEI SCW, suitable for all specifications. 2017 Schemes of Work. Subsets of this information for specific software are also available.

- Student tasks using GeoGebra graphical calculators
- Student tasks using Desmos
- Student tasks using GeoGebra

AS/A level Mathematics

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)	Surds and 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 (Desmos) 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](http://mei.org.uk/integrating-technology)

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