

## Differential Equations with Technology (1)\*

Year 13 students in the UK were asked to find the general solution of the differential equation  $y' = 3x^2 + 2x$ . The following conversation takes place in the class:

**Student A:** Easy! The answer is  $y = x^3 + x^2$ .

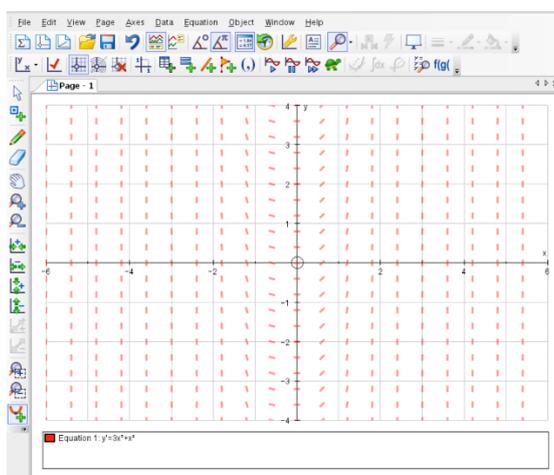
**Teacher:** Student A thinks the answer is  $y = x^3 + x^2$ . Open your iPads, and use GeoGebra or Autograph to check if that is the right answer.

Students A and B are trying to solve the problem on their iPads:

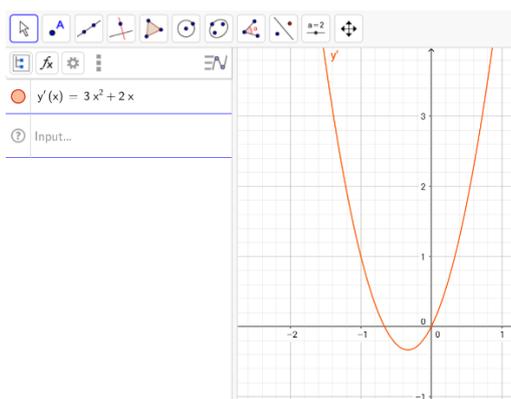
**Student A:** I am going to enter  $y'$  on Autograph, I think the software will give me the solution in seconds and I will see if my answer is correct!

**Student B:** I will use Geogebra, I always use it and it works well.

**Student A:** I have entered  $y' = 3x^2 + 2x$  look what I got! I do not think Autograph works for this question!



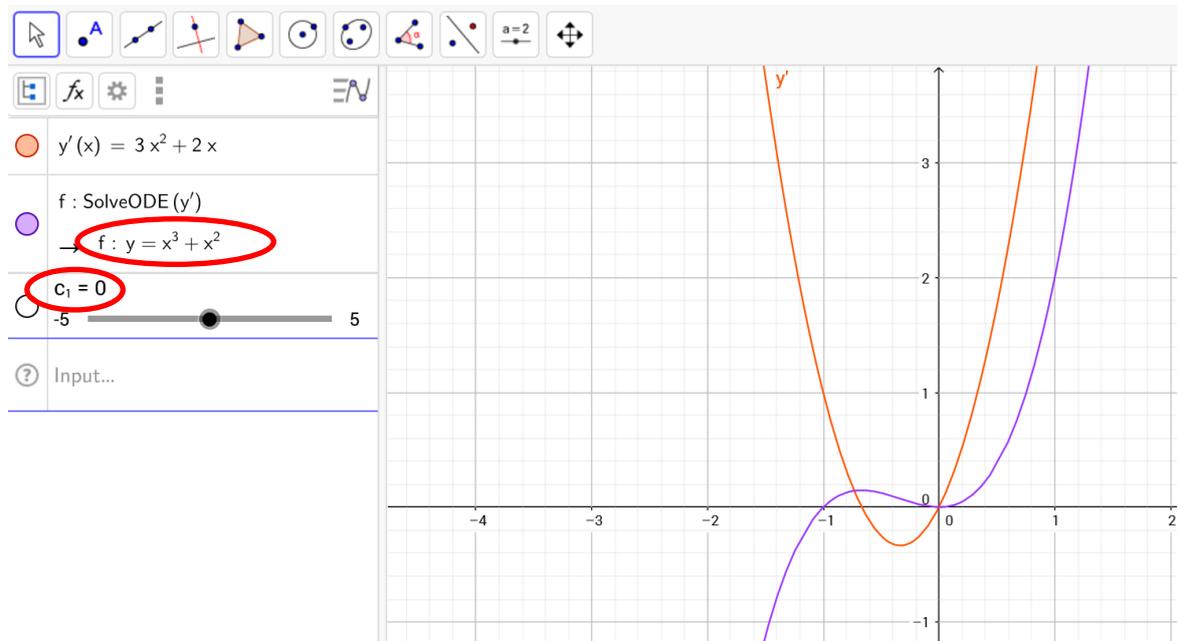
**Student B:** Look at my screen on Geogebra. I only got the graph of  $y' = 3x^2 + 2x$ . But, how can I find  $y$ ?



**Student A:** Let's just google it!

Both google "differential equations on Geogebra" and find that they can use "solveODE" to find  $y$ .

**Student B:** Ok, I am entering solveODE, and the software is asking for the name of the function which is  $y'$ , entered and the answer is  $y = x^3 + x^2$ . You were right!



**Student A:** Yep! That was my answer in the first place! But what is that  $c_1$  on the screen and what is that slider?

**Student B:** I don't know and I don't care...! We already got the answer!  
You are the teacher and you just heard this exchange between students A and B.

**Questions:**

- What are the issues emerging from the exchange between students A and B?
- How do you interpret the outcomes on Autograph and GeoGebra?
- How would you respond to students A and B and to the whole class?

\*Inspired by the doctoral research of Lina Kayali

This is a Task developed by the MathTASK 2016-17 team. Let us know whether it is useful and how we can improve it at @mathtask or email Irene Biza at [i.biza@uea.ac.uk](mailto:i.biza@uea.ac.uk). For more tasks, visit [MathTASK](https://www.math-task.org/).