

Tangent Task

Year 12 students, specialising in mathematics, were given the following exercise:

“Examine whether the line with equation $y = 2$ is tangent to the graph of function f , where

$$f(x) = 3x^3 + 2$$

Two students responded as follows:

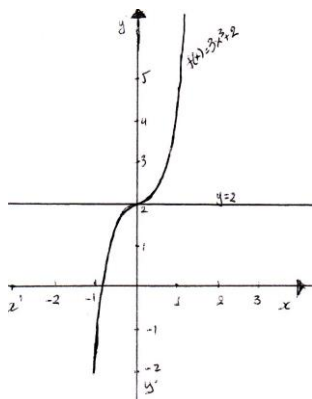
STUDENT A: I will find the common points between the line and the graph solving the system:

$$\begin{cases} y = 3x^3 + 2 \\ y = 2 \end{cases} \Leftrightarrow \begin{cases} 3x^3 + 2 = 2 \\ y = 2 \end{cases} \Leftrightarrow \begin{cases} 3x^3 = 0 \\ y = 2 \end{cases} \Leftrightarrow \begin{cases} x = 0 \\ y = 2 \end{cases}$$

The common point is A (0, 2).

The line is tangent of the graph at point A because they have only one common point (which is A).

STUDENT B: The line is not tangent to the graph because, even though they have one common point, the line cuts across the graph, as we can see in the figure.



Questions:

- In your view what is the aim of the above exercise?
- How do you interpret the choices made by each of the students in their responses above?
- What feedback would you give to each of the students above with regard to their response to the exercise?

Publications with reference to the *Tangent Task*

- Biza, I., Nardi, E., & Zachariades, T. (2014). Using situation-specific tasks to explore teacher mathematical knowledge and pedagogical beliefs: Examples from algebra and analysis [Translated into Portuguese]. In T. Rogue & V. Giraldo (Eds.), *O saber do professor de matemática: ultrapassando a dicotomia entre didática e conteúdo [Mathematics teachers' knowledge: beyond the dichotomy between pedagogy and content]* (pp. 221-255).
- Biza, I., Nardi, E., & Zachariades, T. (2009). Teacher beliefs and the didactic contract on visualisation. *For the Learning of Mathematics*, 29(3), 31-36.
- Biza, I., Nardi, E., & Zachariades, T. (2009). Do images disprove but not prove? Teachers' beliefs about visualisation. In F. L. Lin, F. J. Hsieh, G. Hanna & M. d. Villiers (Eds.), *Proceedings of*

the 19th Study of the International Commission on Mathematical Instruction: Proof and Proving in Mathematics Education (Vol. 1, pp. 59-64). Taipei. Taiwan.

Biza, I., Nardi, E., & Zachariades, T. (2009). Teachers' views on the role of visualisation and didactical intentions regarding proof. In V. Durand-Guerrier, S. Soury-Lavergne & F. Arzarello (Eds.), *Proceedings of the 6th Conference of European Research in Mathematics Education (CERME)*. (pp. 261-270). Lyon, France.

Biza, I., Nardi, E., & Zachariades, T. (2008). Persistent images and teacher beliefs about visualisation: the tangent at an inflection point. In O. Figueras & A. Sepúlveda (Eds.), *Proceedings of the 32nd Conference of the International Group for the Psychology of Mathematics Education (PME)* (Vol. 2, pp. 177-184). Morelia, Michoacán, México: PME.

Nardi, E., Biza, I., & Zachariades, T. (2012) 'Warrant' revisited: Integrating mathematics teachers' pedagogical and epistemological considerations into Toulmin's model for argumentation. *Educational Studies in Mathematics*, 79(2), 157–173.

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Let us know whether this task is useful at @mathtask or email Irene Biza at i.biza@uea.ac.uk. For more tasks, visit [MathTASK](#).