

Write your title here

Write your research question here

Your name

Athénée de Luxembourg

Mathematics - your class

Investigation/IA/EE

Word Count: xx

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1 Introduction

With the purpose of discovering the different fields of study within the umbrella term mathematics, I came across numerical analysis which sparked my interest as it implements algorithms with the aim of solving mathematical analysis problems with continuous variables. After some further research, I discovered the Weierstrass approximation theorem, defining the key element of polynomial approximation being that '*any continuous function on a closed and bounded interval can be uniformly approximated on that interval by polynomials to any degree of accuracy.*'¹ Essentially, this states that a graph which consists of a single unbroken curve in a defined domain can be expressed by a polynomial function whose precision in approximating is determined by its degree. With the aim of analyzing the application of this theorem, I will consider a continuous function which I will approximate with three different polynomial approximation methods.

2 A few lines of calculations

The formula of a slope can be proven as follows. For the points $A(x_1; y_1)$ and $B(x_2; y_2)$, that satisfy the equation, I establish:

$$\begin{cases} y_1 = mx_1 + b \\ y_2 = mx_2 + b \end{cases}$$

Thus, I can subtract one of these from the other:

$$\begin{aligned} y_2 - y_1 &= mx_1 + b - (mx_2 + b) \\ \Leftrightarrow y_2 - y_1 &= mx_1 - mx_2 \\ \Leftrightarrow m &= \frac{y_2 - y_1}{x_2 - x_1} \end{aligned}$$

This can be rewritten to find the formula, I used, of a straight line:

$$y_2 = y_1 + \frac{y_2 - y_1}{x_2 - x_1} \cdot (x_1 - x_2)$$

3 A matrix

To continue, we transfer our values into an augmented matrix.

$$\begin{bmatrix} 7 & 1 & 4 \\ 3 & 1 & 6 \end{bmatrix}$$

The next step is to add (-3) times the first line to 7 times the second line to triangulize the matrix.

$$\Leftrightarrow \begin{bmatrix} 21 & 3 & 12 \\ 0 & -4 & -30 \end{bmatrix}$$

¹<https://math.stackexchange.com/questions/tagged/weierstrass-approximation>

4 Inserting a graph from GeoGebra

Below you can see the graphical representation of $y = -\frac{1}{2}x + \frac{15}{2}$. As you can see in Figure 1, the line passes

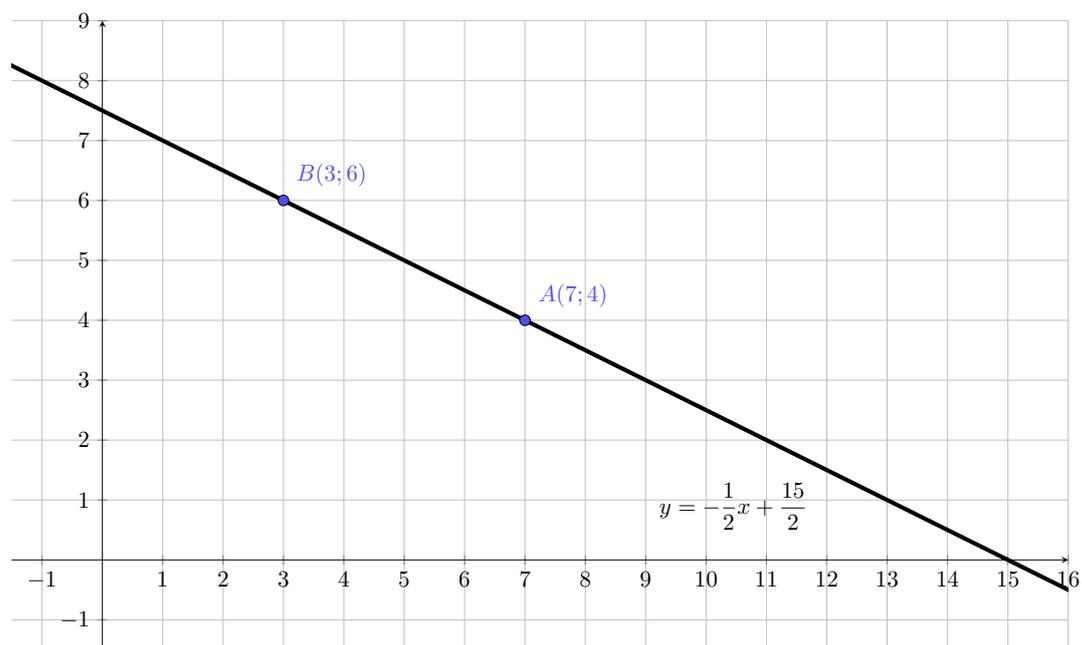


Figure 1: Linear model representing $y = -\frac{1}{2}x + \frac{15}{2}$

through the two previously chosen points; $A(7;4)$ and $B(3;6)$, which indicates that our model is correct, that we made no mistakes in our calculations.

5 Creating a table

Fill in the following divisibility table.

	2	3	4	5	6	7	9	11	15
3465									
4725									

Table 1: Divisibility table

6 Inserting QR Codes

How to install and use the Excel add in *Excel2Latex*



YouTube video: Secant Method | Oscar Veliz



7 Inserting an image



Figure 2: Weisshorn, Randa, Switzerland. Author: Samuel Ferrara

8 Customizing the enumerate environment

A. Typesetting

- 1) Written in \LaTeX and includes
- 2) Cover page
- 3) Header/footer
- 4) Table of contents
- 5) Introduction and conclusion

B. Format

- a) Divide into different sections/subsections
- b) Each mathematical expression inside math mode ($\$ \$$ or $\$ \$ \$ \$$)
- c) Each figure should have a caption
- d) Reference figures correctly in your text

9 Customizing the itemize environment

- First draft: 31-Feb-2029 9pm via MS Teams Assignment
- Final report: 31-Sep-2029 9pm via MS Teams Assignment
- * Submit as a PDF file via Teams
- Name of draft: Name-FirstName-Draft.pdf
- Name of final report: Name-FirstName-Final.pdf

10 Bibliography

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