The uses of Wolfram Alpha in Mathematics

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Introduction

Wolfram|Alpha is a special engine to generate answers and provide more information about the answers given. By using its vast store of expert-level knowledge and algorithms it can automatically answer questions, do analysis and generate reports. Other search engine gives you information, but Wolfram|Alpha gives you the answer. Wolfram|Alpha is ideal for the sort of math that Google's calculator and most other calculator websites couldn't solve the questions given. It even provides graphs that help students understand the mathematical concept itself. According to Flanagan (2008), many educators use a variety of technologies to enhance student interest and achievements. To access Wolfram|Alpha, simply go to the link https://www.wolframalpha.com/, then its interface is shown in figure 1.

The mathematical expressions used in Wolfram|Alpha are slightly different from the calculator. Table 1 shows the commands used in Wolfram|Alpha for mathematical expression.

Table 1. Wolfram alpha's command

Mathematical expression	Command
$\frac{x^2-36}{5(x-6)}$	((x^2)-36)/(5(x-6))
$\frac{x^2}{\sqrt{x^4-5}}$	(x^2)/sqrt((x^4)-5)

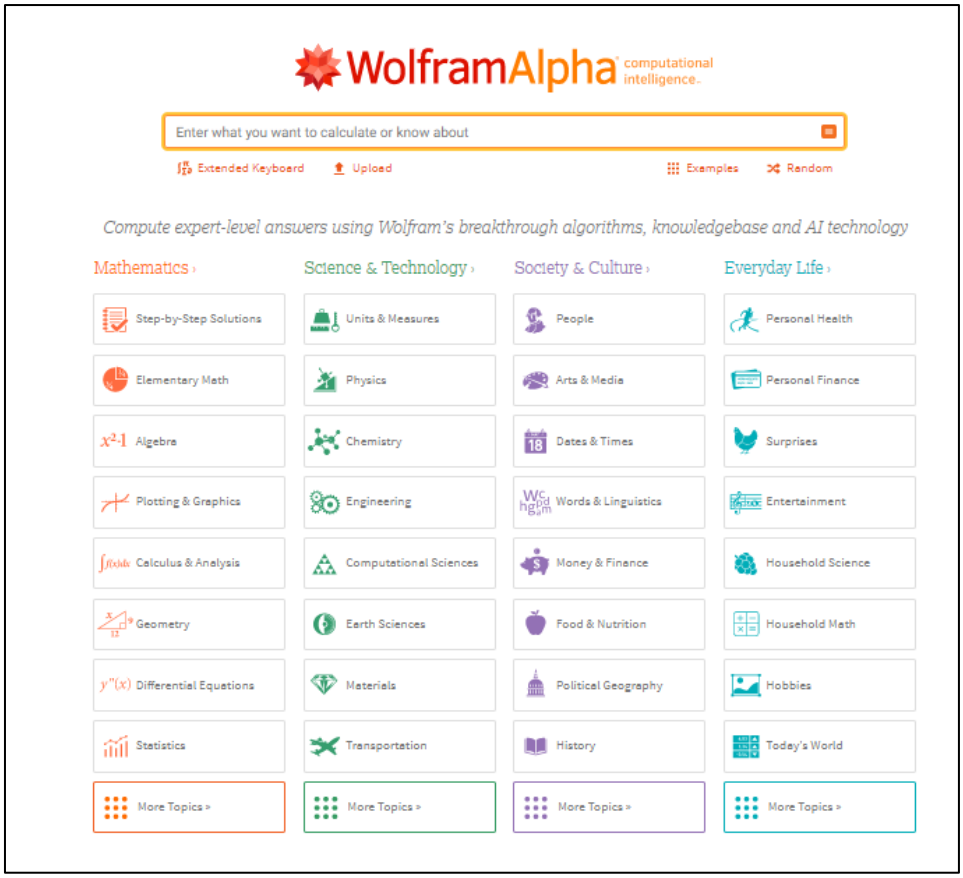


Figure 1. Wolfram|Alpha's interface

Limit of a function

Limit is one of the most useful branches of mathematics (McGregor et. al 2010). Therefore, knowledge of limits is very important. In Wolfram|Alpha, just type the word 'limit' in the dialogue box. Then enter the function and value to approach. Figure 2 shows the interface that appears when you want to solve the limit question.

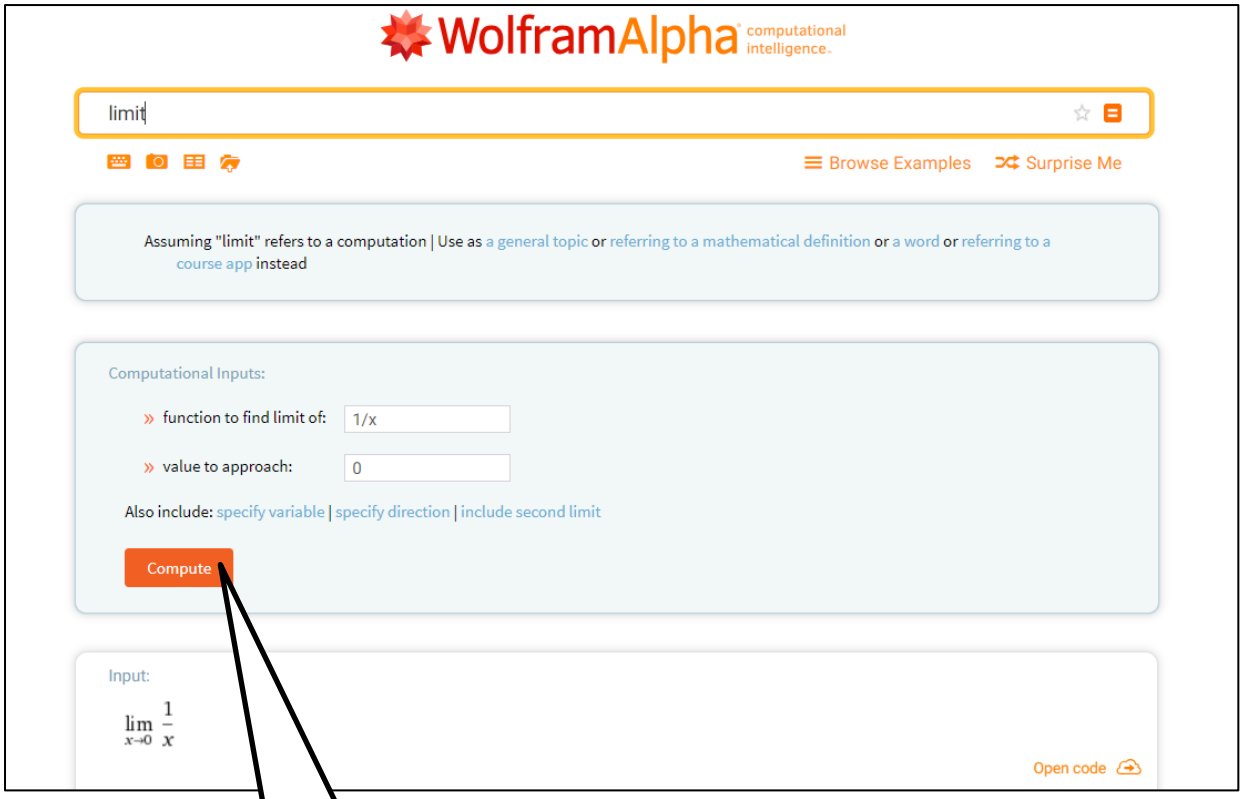
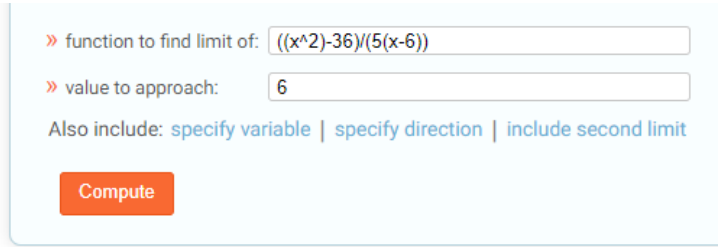
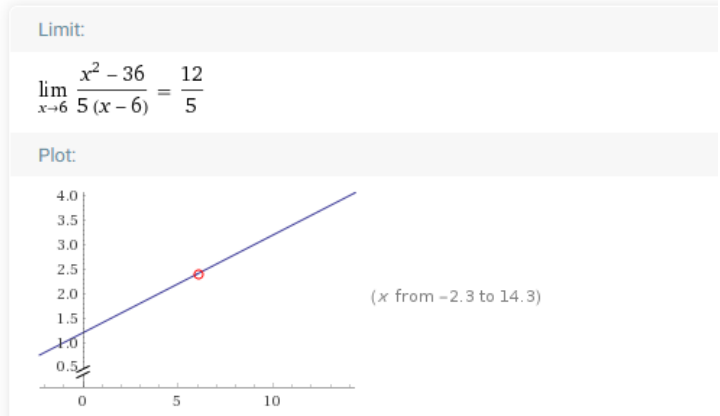
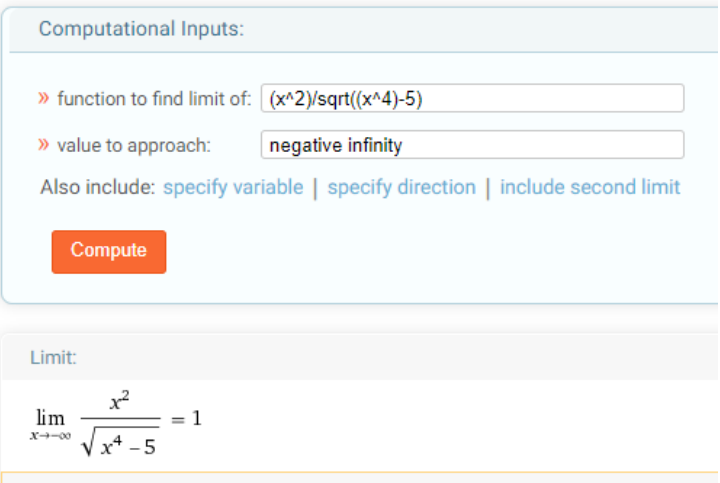


Figure 2. Limit's interface

Click button compute to get the answer

Table 2 shows the limit questions that were solved using Wolfram|Alpha and manually.

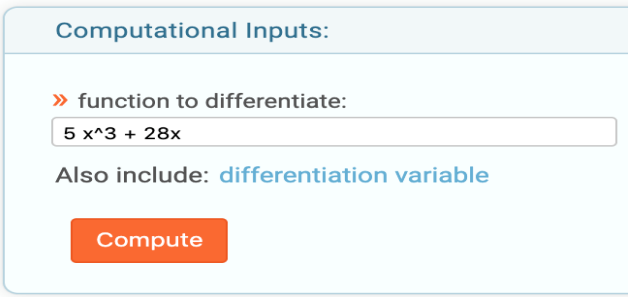
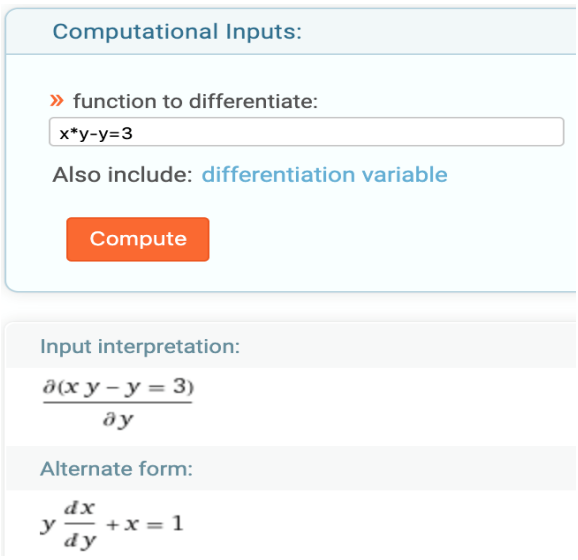
Table 2. Limit's questions

Wolfram|Alpha	Manually
 	$\lim_{x\to 6} \frac{1}{x-6}\left(\frac{x^2-36}{5}\right)$ $= \lim_{x\to 6} \frac{(x-6)(x+6)}{5(x-6)}$ $= I\,im_{x\to 6} \frac{x+6}{5} = \frac{12}{5}$
 	$\lim_{x\to-\infty}\left(\frac{x^2}{\sqrt{x^4-5}}\right)$ $\lim_{x\to-\infty}\left(\frac{\frac{x^2}{x^2}}{\sqrt{\frac{x^4-5}{x^4}}}\right)$ $= \lim_{x\to-\infty}\left(\frac{1}{\sqrt{1-\frac{5}{x^4}}}\right) = 1$

Differentiation

Differentiation is the measures of computing a derivative. The derivative of a function y = f(x) of a variable x is a steps of the rate at which the value y of the function changes with respect to the change of the variable x. It is called the derivative of f with respect to x. Differentiation allows us to find rates of change. For example, it allows us to find the rate of change of velocity with respect to time (which is acceleration). It also allows us to find the rate of change of x with respect to y, which on a graph of y against x is the gradient of the curve. There are a number of simple rules which can be used to allow us to differentiate many functions easily. Table 3 shows the differentiation questions that were solved using Wolfram|Alpha and manually.

Table 3. Differentiation's questions

Wolfram|Alpha	Manually
	$\frac{d}{dx}(5x^3 + 28x)$ $= 15x^2 + 28$
	$xy - y = 3$ $x\frac{dy}{dx} + y(1) - \frac{dy}{dx} = 0$ $x\frac{dy}{dx} + y - \frac{dy}{dx} = 0$ $x\frac{dy}{dx} - \frac{dy}{dx} = -y$ $\frac{dy}{dx}(x - 1) = -y$ $\frac{dy}{dx} = \frac{-y}{x - 1}$

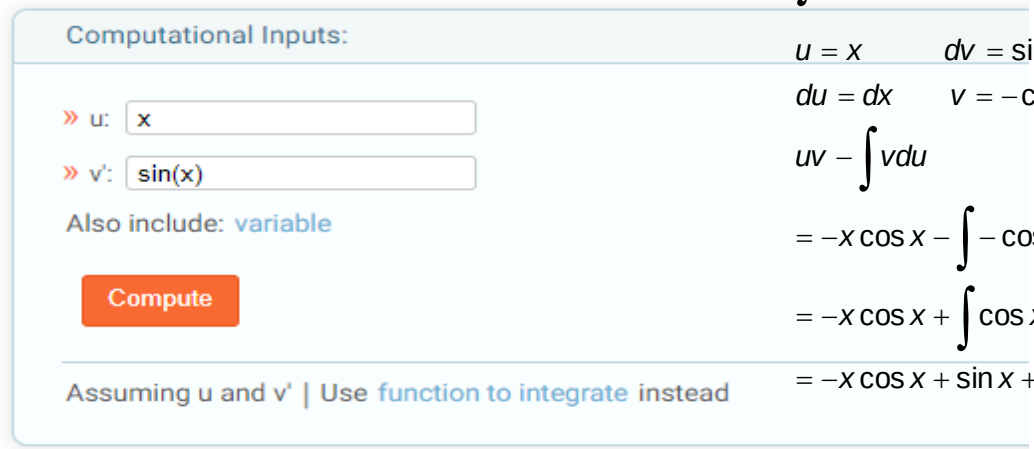
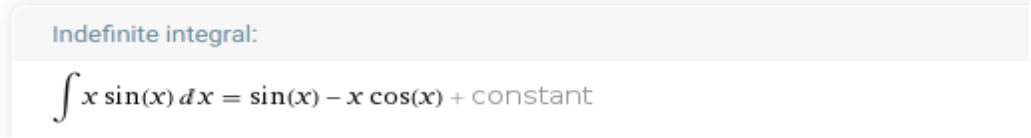
Integration

Integration is one of the two major calculus in Mathematics, apart from differentiation. Integration is the reversed of differentiation which used to find areas, volumes, central points and many useful things. There are several techniques of integration such as integration by substitution, integrations by parts, integration by partial fractions, and integration using trigonometric identities. In this paper, we just focused on how to solve the integration by substitution and integration by parts by using Wolfram|Alpha. To solve question that use integration by parts using Wolfram|Alpha, just type the word 'integration by parts' in the dialogue box. Then enter the function of 'u' and 'v' or 'dv'. Meanwhile, to solve question that use integration by substitution in Wolfram|Alpha, just type the function that we want to evaluate in the dialogue box. Then just press the 'enter'. Table 4 shows the integration questions that were solved using Wolfram|Alpha and manually.

Conclusion

In general, the development of our country is strongly connected with the growth of the development in technology. According to Harris (2016), Technology also had makes humans life easier and more comfortable in some aspects including in educations. Nowadays, there are so many software has been developed to make it easier for student to complete their studies. However, some of them that is used in the classroom for student learning cannot simply be a replacement of best practices in teaching and learning for students. Teachers must continue to be learners themselves to produce the best teaching methods and introduce technology that works for their classroom and the specific needs of their students. The process of learning also should be creative and captivating. Thus, the programs, materials, and projects done should be meaningful to the students. When this is done correctly, we will see the higher engagement and achievement levels of students and the desire of student to learn.

Table 4. Integration's questions

Wolfram|Alpha	**Manually**
i)Integration by Parts   	$\int x \sin x dx$ $u = x \qquad dv = \sin x$ $du = dx \qquad v = -\cos x$ $uv - \int v du$ $= -x\cos x - \int -\cos x dx$ $= -x\cos x + \int \cos x dx$ $= -x\cos x + \sin x + C$
ii)Integration by Substitutions  	$\int \frac{2x}{x^2+1} dx$ Let $u = x^2 + 1$ $\frac{du}{dx} = 2x; \quad du = 2x dx$ $\int \frac{du}{u}$ $= \int \frac{1}{u} du$ $= \log u + C$ $= \log(x^2 + 1) + C$

References:

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