INTEGRAL CALCULATOR

INTRODUCTION

The team, for the final project comprised of two engineers from two different fields of engineering precisely, mechanical engineering and electrical engineering. It is well known that Mathematics plays a vital role in all engineering fields. Hence, the team designed a user friendly GUI (Graphical User Interface), which calculates the integrals of functions entered by the user.

In a layman's language the meaning of integration is to combine one thing with another so that they become a whole. However, in calculus the process of calculating an integral is known as integration. Integration is the inverse of differentiation, since integrating a given function results in a function whose derivative is the given function. The general idea for making such a GUI was to ease the burden of implying the application of integral in engineering workspace. Some examples of the general applications of integration are finding areas of a defined closed object, finding velocity from acceleration, finding motion path of an object from velocity, finding the work done by an object, etc.

In a nutshell, the GUI designed provides up to the third integral of the function as demanded by the user. Furthermore, the GUI also gives a value of the integrated function in regard to the assigned limits of the function. Additional features of the GUI that are in lieu to the topics learnt in class are to finding area, velocity, work done by an object, arc length of a defined function and a knowledge-testing feature that helps the user to understand the concept of application of integrals.

INSTRUCTIONS

The designed GUI is very user friendly. It is divided into three segments. It can be used as a learning tool in order to understand the application of integrals, it can be used as an integral calculator wherein, the user gets the integral for the desired function within the defined limits and it can also be used to implement the applications of integration. The user is provided with a variety of choices as discussed above. The GUI functions, depending upon the choice of the user as follows:

- When the program is run, the first GUI screen appears as shown in Figure 1.
- The user is allowed to enter a function and attain its integral up to the third order in the initial window that appears. Furthermore, the user can also get definite integrals by putting in desired limits of the function.
- The GUI comprises of buttons such as 'Instruction' and 'Description' to help the user with any difficulty in operating the GUI. Furthermore, the user can select the buttons; 'Test Your Knowledge' and 'Application of Integral' which will further open a new GUI window respectively for more interactive operations.

- The 'Application of Integral' button wherein the user can enter a function with its limits to obtain the arc length, are, or velocity of that particular function. The window is as shown in Figure 2.
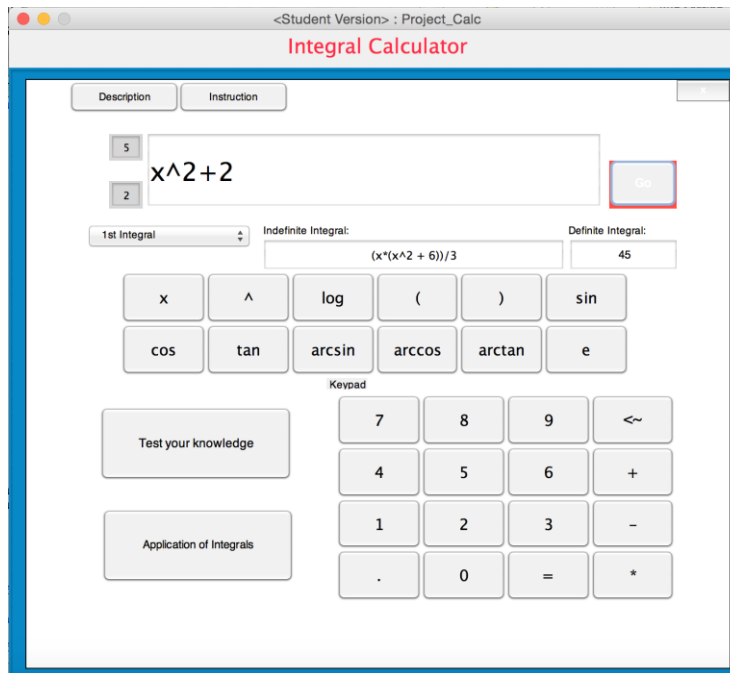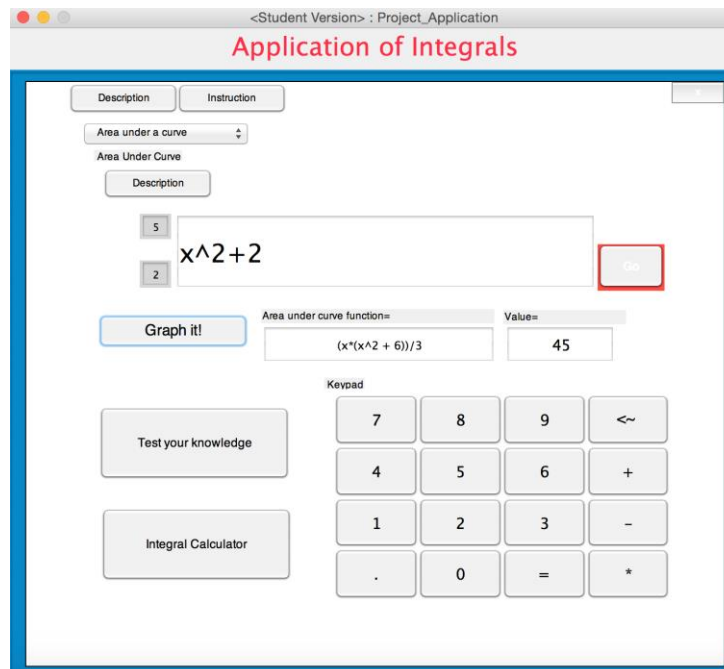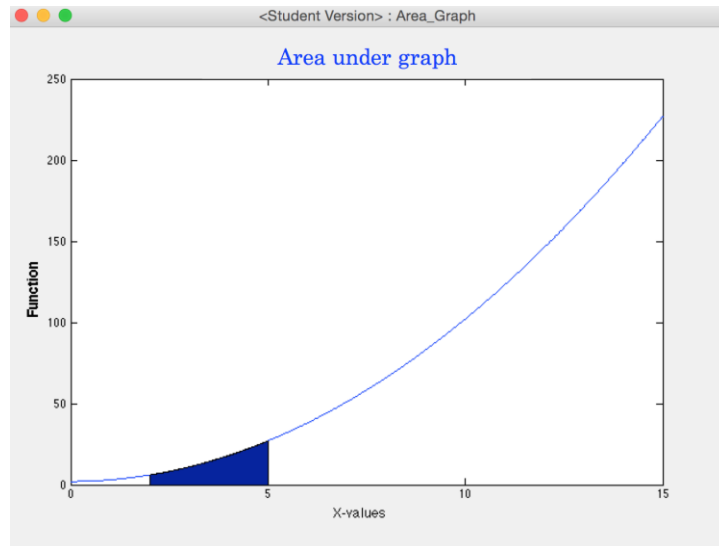

Figure 1.

Figure 2.

- This window further allows the user to obtain a graph of the defined function within the set limits to explain the function graphically as shown in Graph 1.

<u>Graph 1.</u>

- The selection of 'Test Your Understanding' will lead to the opening of a new window as shown in Figure 3. This is an interactive window where the user can read through the instructions and clarify the concept of application of interval. The GUI using interactive sounds verifies the input of a right or wrong answer.

<u>Figure 3.</u>

TEAM CHALLENGES

The team worked equally on the project. The main challenges encountered by the team were to choose a suitable topic for the project and to make it stand apart from other groups by designing user friendly GUI. Furthermore, the addition of the 'Test Your

Understanding' section is a big success for the team as it really explains how to imply the application of integral in the everyday engineering workspace.

CONCLUSION

Overall the project was a success based upon the work put in the output. The project stands to our expectations providing the user with a very interactive platform to understand the application of integral and also use the GUI as an everyday tool in their workspace in order to find the integral and to graph the function as well. The project has a lot of details that are very clear from the user's point of view yet not making the GUI messy.

In a nutshell, The GUI project is a fun and interactive tool that can be used by a user in order to solve their integration and application of integration problems assisted by a knowledge tool which will not let the user deviate from the topic.