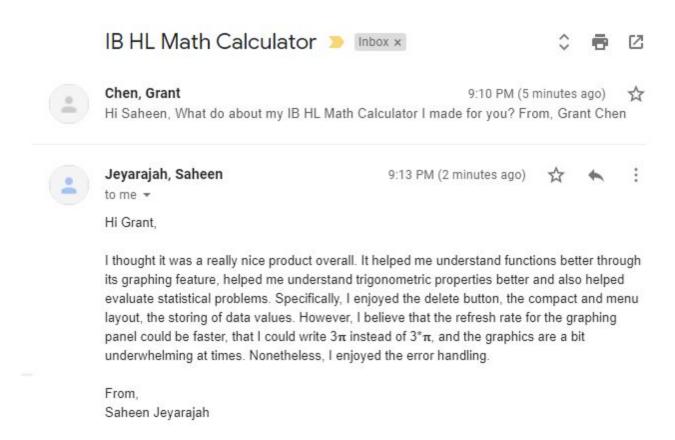# Criterion E: Evaluation

Success Criteria	Evaluation
Evaluate math string expressions entered through buttons	Buttons are clearly labelled and function properly. Each time a button is clicked, the math expression updates. The evaluation of the math expression is accurate. However, overflow happens with extremely large numbers and negative numbers such as -1 have to be represented as 0-1 which is cumbersome. This inability to input negative numbers directly was cumbersome as stated by the client.
Easy editing of math string expressions with many features	There are delete buttons that remove the last button clicked and not just the last character. This allows for effective and efficient editing of the expressions. There are several practical operations which are all present in scientific calculators. The client appreciated the delete button which worked effectively.
Easy switching between panels that save the data	The menu was very effective as it can expand for use and collapse after use while requiring minimal space of the panel. Within the menu were the different modes/panels the user could access. The client appreciates the compact and minimalistic menu layout.
Easy addition and removal of data for statistics panel with statistics constantly refreshed and backed up	The entirety of this criteria was met. All statistics functions would update with each insertion of data values and would be stored in a text file. The client appreciated this feature of storing data as there are many values required in IB stats problems.
Graphing Calculator displays accurate graphs	The background grid was effectively made without drawing the user's attention as the focus should be on the function. Functions were accurately drawn and were able to encompass regions of undefined values such as the square of x for x<0. There was no numbered scale and some functions such as ln(x) became discontinuous at extremely low values due to the rapid rate of change. The client did mention that the refresh rate of the calculator is very fast for 1 function but quickly gets slower as the number of present functions increases.
Easy addition and removal of functions	Same input display as the scientific calculator, providing familiarity to the user. However, only functions could be added so non-functions such as $x = y^2$ cannot be added. The client mentioned that string texts such as 3π are considered invalid despite the mathematical convention for the 3 to be multiplied with the π.
Evaluation of f(x), f'(x), F(x), and f(x) = g(x)	The evaluation of the f'(x) can be inaccurate sometimes as an approximation was used. The same applies for F(x). Approximations were also used for the binary search of x such that f(x) = g(x), sometimes providing inaccurate values. For example, $e^x=0$ has no solution, but the program will output one. The client mentioned that the graphics in this panel are a bit underwhelming.
Trig panels should display proper unit circle with rotating triangle	This criteria was met to a high degree.

Proper error handling	Catches all errors and notifies the user, which the client appreciated.

Client Response

IB HL Math Calculator ▶ Inbox ×

Chen, Grant   9:10 PM (5 minutes ago)
Hi Saheen, What do about my IB HL Math Calculator I made for you? From, Grant Chen

Jeyarajah, Saheen   9:13 PM (2 minutes ago)
to me ▾

Hi Grant,

I thought it was a really nice product overall. It helped me understand functions better through its graphing feature, helped me understand trigonometric properties better and also helped evaluate statistical problems. Specifically, I enjoyed the delete button, the compact and menu layout, the storing of data values. However, I believe that the refresh rate for the graphing panel could be faster, that I could write 3π instead of $3*\pi$, and the graphics are a bit underwhelming at times. Nonetheless, I enjoyed the error handling.

From,
Saheen Jeyarajah

Proposals for the future improvement of the product

- Display math string expressions in a better format. For example, 3/4 should not be displayed, but rather a fraction where the 3 is above the 4, not in front of it.
- A login feature for security could be implemented
- Make the refresh of the graph panel faster. Some dynamic programming to store common values so that it takes constant time as opposed to evaluating the same expression several times which takes a lot of time

Words: 87