Problem 1 **Simran Sidhu**
SOEN6481 **40011611**

1 Give a brief description, not exceeding one page, of your number, including the characteristics that make it unique.

Function : Natural logarithm of 2 i.e. $ln_e 2$

Definitions :
Irrational Numbers - are the numbers that cannot be represented as ratio or a fraction.
Natural Logarithm - The natural logarithm of a number x is nothing but log to the base e of x. Here e has a approximate value of 2.718.

$log_e x$ can be written as ln x

ln is called the natural log. The project is based on the natural logrithm of 2 ie. $ln_e 2$.
The value of $ln_e 2 \approx 0.69314718056$ and it is an irrational number i.e cannot be expressed in fractional form.

The proof of $ln_e 2$ being irrational goes something like :
Let suppose, $ln_e 2$ is rational i.e. there exist a x,y integers > 0 and they can represent the natural log of 2.
Therefore it can be said :
$ln_e 2 = x/y$
Applying exponential to both LHS and RHS , we get:
$e^{ln_e 2} = e^{x/y}$
$2 = e^{x/y}$
$2^y = e^x$

Since we know e is a transcendental number and from the theorm mentioned the famous book - "Proofs from the book" [1],Page 45, e^r , where r is rational number not equal 0 , is irrational we can say that $ln_e 2$ is also an irrational number i.e. cannot be denoted as ratio of two integers with value > 0. The understanding of the proof was gathered from the website [2] - concept explained by Richard Morris, Maths tutor, doctorate in mathematics/computer science.

Reference

1. Aigner, Martin, and Günter M. Ziegler. Proofs from THE BOOK. Fourth ed.
2. "How Do I Prove ln2 Is Irrational?" Quora, www.quora.com/How-do-I-prove-ln2-is-irrational.