**ECSE 443 - Assignment 1**

**Question 1 – a)** MATLAB values, Refer to Matlab file Q1 section a

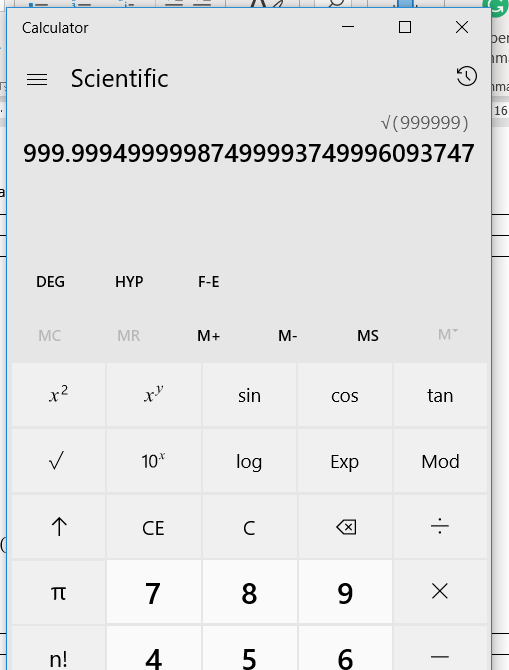
|  |  |  |  |
| --- | --- | --- | --- |
| x = | 10 | 1000 | 1000000 |
| F(x) | 1.6228 | 15.8153 | 500.0001 |

**b)** Calculator values: For these calculations I used my computer calculator which kept the most significant digits when compared to a standard calculator. This is due to the fact I wanted to keep as many digits as possible before rounding down.

For x = 10:

For x = 1000:

For x = 1000000:



|  |  |  |  |
| --- | --- | --- | --- |
| x = | 10 | 1000 | 1000000 |
| F(x) | 1.6228 | 15.8000 | 1000 |

**c)** Matlab Error Results with Calculator results. Refer to Matlab file Q1, section c.

abs\_error = 1×3

1. -0.0153 499.9999

per\_relative\_err = 1×3

0.0014 -0.0970 99.9999

**d)** Refer to Matlab file Q1, section d for calculation.

Starting Function:

Simplified:

For X = 10:

For X = 1000:

For X = 1000000:

|  |  |  |  |
| --- | --- | --- | --- |
| x = | 10 | 1000 | 1000000 |
| F(x) | 1.62278 | 15.8153 | 500.000 |

**e)** Matlab Error Results compared with modified function results in d). Refer to Matlab file Q1, section e.

abs\_error = 1×3

10-3 ×

0.0034 -0.0431 -0.1250

per\_relative\_err = 1×3

10-3 ×

0.2094 -0.2727 -0.0250

The calculated error between the Matlab calculation and the modified function is lower for most inputs due to the elimination of subtraction in the function. When the subtraction operation occurs, it leads to a lost of significant figures when the two operands are close to one another. Therefore, the removal of this operation allows for a more precise result.

**Question 2 – a)** MATLAB values, Refer to Matlab file Q2 section a

|  |  |
| --- | --- |
| X= | 0.007 |
| F(x) | C:\Users\bjay2\AppData\Local\Temp\ConnectorClipboard5720896608659911961\image15487740869940.png |

**b)** Again, I used my computers calculator to perform the calculations due to its extra significant figures therefore when I perform my rounding later it less likely to be effected by initial rounding made by my standard calculator.

|  |  |
| --- | --- |
| X= | 0.007 |
| F(x) | 0.00342860 |

**c)** Refer to Matlab file Q2, section c.

abs\_error =

C:\Users\bjay2\AppData\Local\Temp\ConnectorClipboard5720896608659911961\image15487741274990.png

per\_relative\_err =

C:\Users\bjay2\AppData\Local\Temp\ConnectorClipboard5720896608659911961\image15487741348400.png

**d)** Refer to Matlab file Q2, section d for calculation.

Original Function:

Simplified Function:

For X = 0.007:

|  |  |
| --- | --- |
| X= | 0.007 |
| F(x) | 0.00350001 |

**e)** Matlab Error Results compared with modified function results in d). Refer to Matlab file Q2, section e.

abs\_error =

C:\Users\bjay2\AppData\Local\Temp\ConnectorClipboard5720896608659911961\image15487763695540.png

per\_relative\_err =

C:\Users\bjay2\AppData\Local\Temp\ConnectorClipboard5720896608659911961\image15487763814660.png

Similarly, to above in Q1, section e, the absolute and percent relative error are both much smaller due to the removal of the subtraction operation. The subtraction operation results in a loss of significant figures when the operations are similar.

**Question 3 – a)**