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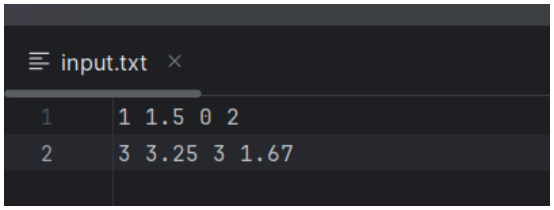
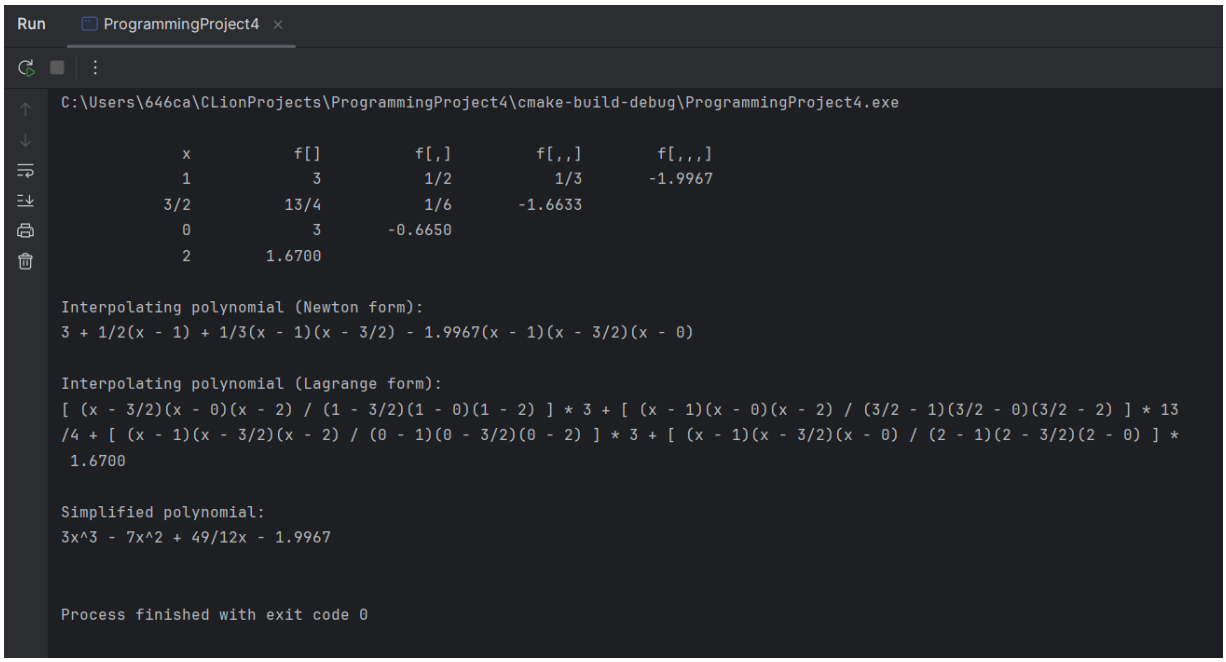
Numerical Methods (CS3010)

April 26th, 2025

Programming Project 4 Report

First input (input.txt from Canvas)





Second input

input2.txt

```
-2 -1 0 1 2
5 2 1 2 5
```

Run ProgrammingProject4

```
C:\Users\646ca\CLionProjects\ProgrammingProject4\cmake-build-debug\ProgrammingProject4.exe

            x          f[]         f[,]        f[,,]       f[,,,]      f[,,,,]
           -2           5           -3           1            0            0
           -1           2           -1           1            0
            0           1            1           1
            1           2            3
            2           5

Interpolating polynomial (Newton form):
5 - 3(x + 2) + 1(x + 2)(x + 1) + 0(x + 2)(x + 1)(x - 0) + 0(x + 2)(x + 1)(x - 0)(x - 1)

Interpolating polynomial (Lagrange form):
[ (x - -1)(x - 0)(x - 1)(x - 2) / (-2 - -1)(-2 - 0)(-2 - 1)(-2 - 2) ] * 5 + [ (x - -2)(x - 0)(x - 1)(x - 2) / (-1 - -2)(
-1 - 0)(-1 - 1)(-1 - 2) ] * 2 + [ (x - -2)(x - -1)(x - 1)(x - 2) / (0 - -2)(0 - -1)(0 - 1)(0 - 2) ] * 1 + [ (x - -2)(x -
 -1)(x - 0)(x - 2) / (1 - -2)(1 - -1)(1 - 0)(1 - 2) ] * 2 + [ (x - -2)(x - -1)(x - 0)(x - 1) / (2 - -2)(2 - -1)(2 - 0)(2
 - 1) ] * 5

Simplified polynomial:
5x^4 + 7x^3 - 4x^2 - 8x


Process finished with exit code 0
```

Third input

input3.txt

```
5 20 35 60 78
12 31 28 55 70
```

Run ProgrammingProject4

```
C:\Users\646ca\CLionProjects\ProgrammingProject4\cmake-build-debug\ProgrammingProject4.exe

            x          f[]         f[,]        f[,,]       f[,,,]      f[,,,,]
            5           12        19/15      -0.0489       0.0015      -0.0000
           20           31         -1/5       0.0320      -0.0007
           35           28       1.0800      -0.0057
           60           55          5/6
           78           70

Interpolating polynomial (Newton form):
12 + 19/15(x - 5) - 0.0489(x - 5)(x - 20) + 0.0015(x - 5)(x - 20)(x - 35) - 0.0000(x - 5)(x - 20)(x - 35)(x - 60)

Interpolating polynomial (Lagrange form):
[ (x - 20)(x - 35)(x - 60)(x - 78) / (5 - 20)(5 - 35)(5 - 60)(5 - 78) ] * 12 + [ (x - 5)(x - 35)(x - 60)(x - 78) / (20 -
 5)(20 - 35)(20 - 60)(20 - 78) ] * 31 + [ (x - 5)(x - 20)(x - 60)(x - 78) / (35 - 5)(35 - 20)(35 - 60)(35 - 78) ] * 28 +
 [ (x - 5)(x - 20)(x - 35)(x - 78) / (60 - 5)(60 - 20)(60 - 35)(60 - 78) ] * 55 + [ (x - 5)(x - 20)(x - 35)(x - 60) / (7
8 - 5)(78 - 20)(78 - 35)(78 - 60) ] * 70

Simplified polynomial:
12x^4 - 21581/15x^3 + 54754.2844x^2 - 738928.6874x + 2466697.2451


Process finished with exit code 0
```