

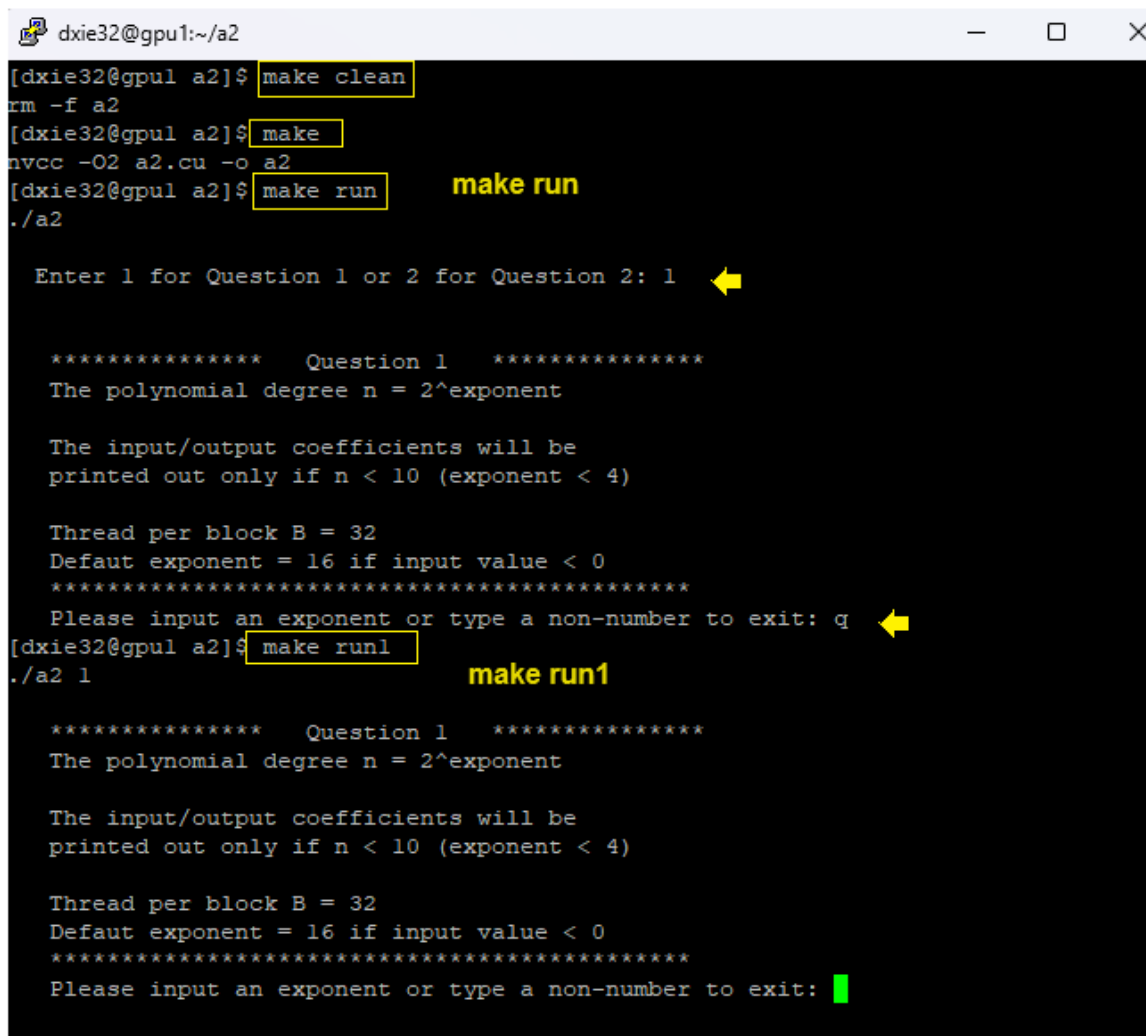
Assignment 2

File included:

- a2.cu
- Makefile
- README.md
- a2.pdf

Question 1

- Compile file: **make**
- Run Question 1 testing:
 - **make run** and enter **1** OR
 - **make run1**



```
dxie32@gpu1:~/a2
[dxie32@gpu1 a2]$ make clean
rm -f a2
[dxie32@gpu1 a2]$ make
nvcc -O2 a2.cu -o a2
[dxie32@gpu1 a2]$ make run
./a2

Enter 1 for Question 1 or 2 for Question 2: 1

***** Question 1 *****
The polynomial degree n = 2^exponent

The input/output coefficients will be
printed out only if n < 10 (exponent < 4)

Thread per block B = 32
Default exponent = 16 if input value < 0
*****
Please input an exponent or type a non-number to exit: q
[dxie32@gpu1 a2]$ make run1
./a2 1

***** Question 1 *****
The polynomial degree n = 2^exponent

The input/output coefficients will be
printed out only if n < 10 (exponent < 4)

Thread per block B = 32
Default exponent = 16 if input value < 0
*****
Please input an exponent or type a non-number to exit: 
```

Testing Cases:

Case 1: $B=32$, $n = 2^{16}$ (default)

```
Please input an exponent or type a non-number to exit: 16
-----
Case: B=32 and n=2^16 takes 2138.81 ms
C Function Verification Passed! - takes 5746.35 ms
-----
```

Case 2: $B=32$, $n = 2^2$

```
Please input an exponent or type a non-number to exit: 2
-----
Case: B=32 and n=2^2 takes 3.665 ms

Input array a:
-1    -1    1    1    1
Input array b:
-1    -1    1    1    1

Output array c:
1     2    -1    -4    -3    0    3    2    1
C Function Verification Passed! - takes 0.001 ms
-----
```

Case 3: $B=32$, $n = 2^3$

```
Please input an exponent or type a non-number to exit: 3
-----
Case: B=32 and n=2^3 takes 1.319 ms

Input array a:
1    0    0    1    -1    -1    -1    0    1
Input array b:
1    0    0    1    -1    -1    -1    0    1

Output array c:
1    0    0    2    -2    -2    -1    -2    1    0    3    4    -1    -2    -2    0    1
C Function Verification Passed! - takes 0.002 ms
-----
```

Case 4: $B=32$, $n = 2^{12}$

```
Please input an exponent or type a non-number to exit: 12
-----
Case: B=32 and n=2^12 takes 2.228 ms
C Function Verification Passed! - takes 22.464 ms
-----
```

Case 5: $B=32$, $n = 2^{14}$

```
Please input an exponent or type a non-number to exit: 14
-----
Case: B=32 and n=2^14 takes 9.408 ms
C Function Verification Passed! - takes 347.578 ms
-----
```

Case 6: $B=32$, $n = 2^{18}$

```
Please input an exponent or type a non-number to exit: 18
-----
Case: B=32 and n=2^18 takes 1036.13 ms
C Function Verification Passed! - takes 89346.9 ms
-----
Please input an exponent or type a non-number to exit: 
```

Question 2

- Compile file: **make**
- Run Question 2 testing:
 - **make run** and enter **2** OR
 - **make run2**

```
dxie32@gpu1:~/a2
[dxie32@gpul a2]$ make clean
rm -f a2
[dxie32@gpul a2]$ make
nvcc -O2 a2.cu -o a2
[dxie32@gpul a2]$ make run2
./a2 2

*****      Question 2      *****
-----
Case: B=32 and n=2^14 takes 1865.77 ms

C Function Verification Passed! - takes 342.641 ms
-----
Case: B=64 and n=2^14 takes 5.479 ms

C Function Verification Passed! - takes 343.151 ms
-----
Case: B=128 and n=2^14 takes 5.409 ms

C Function Verification Passed! - takes 355.231 ms
-----
Case: B=256 and n=2^14 takes 5.282 ms

C Function Verification Passed! - takes 339.584 ms
-----
Case: B=512 and n=2^14 takes 5.115 ms

C Function Verification Passed! - takes 348.436 ms
-----
Case: B=32 and n=2^16 takes 70.876 ms

C Function Verification Passed! - takes 5504.85 ms
-----
Case: B=64 and n=2^16 takes 71.648 ms

C Function Verification Passed! - takes 5475.26 ms
-----
Case: B=128 and n=2^16 takes 71.059 ms

C Function Verification Passed! - takes 5496.14 ms
-----
Case: B=256 and n=2^16 takes 69.535 ms

C Function Verification Passed! - takes 5485.96 ms
-----
Case: B=512 and n=2^16 takes 69.453 ms

C Function Verification Passed! - takes 5495.5 ms
-----

Best performance B for n = 2^14: 64
Best performance B for n = 2^16: 256
[dxie32@gpul a2]$
```

CUDA & Serial Runtime in *ms*

		2^{14}	2^{16}
B = 32	CUDA	1865.77	70.876
	Serial (c function)	342.641	5504.85
B = 64	CUDA	5.479	71.648
	Serial (c function)	343.151	5475.26
B = 128	CUDA	5.409	71.059
	Serial (c function)	355.231	5496.14
B = 256	CUDA	5.282	69.535
	Serial (c function)	339.584	5485.96
B = 512	CUDA	5.115	69.453
	Serial (c function)	348.336	5495.5
Best	CUDA	64	512

README

Makefile

Using Makefile to run programing:

- **make** to compile the application.
- **make clean** to remove all object and output files.
- **make run** to run the application without arguments.
- **make run1** to run the application with argument 1.
- **make run2** to run the application with argument 2.

C verification function

C verification function takes longer time for large input number. If you see the cursor (in red circle) means the programing is still running

```
-----
Case: B=32 and n=2^12 takes 2.228 ms
C Function Verification Passed! - takes 22.464 ms
Please input an exponent or type a non-number to exit: 14
-----
Case: B=32 and n=2^14 takes 9.408 ms
C Function Verification Passed! - takes 347.578 ms
Please input an exponent or type a non-number to exit: 18
-----
Case: B=32 and n=2^16 takes 1036.13 ms
```

C function for verification is still running

```
Please input an exponent or type a non-number to exit: 18
-----
Case: B=32 and n=2^18 takes 1036.13 ms
C Function Verification Passed! - takes 89346.9 ms
Please input an exponent or type a non-number to exit: █
```

Its done. ↑