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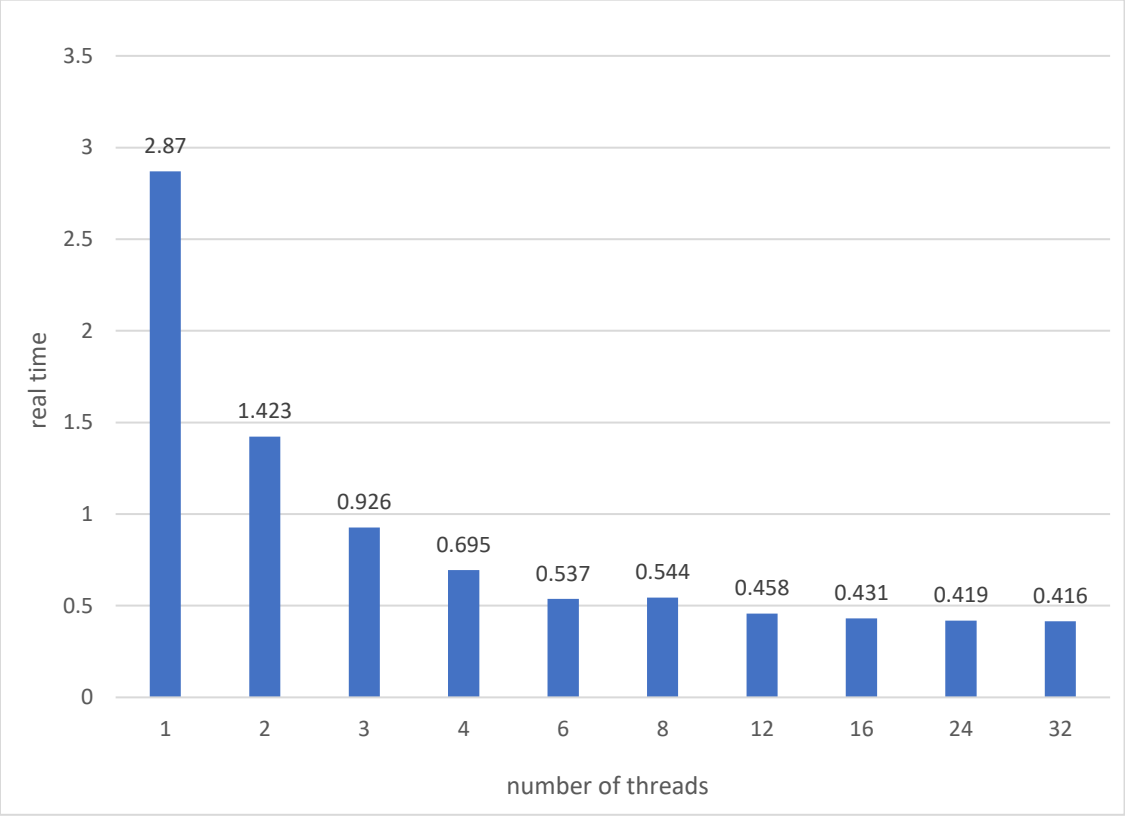
QUESTION 2

A)

Threads	Timing(s)
1 (original)	2.688
1	2.870
2	1.423
3	0.926
4	0.695
6	0.537
8	0.544
12	0.458
16	0.431
24	0.419
32	0.416



B) Yes, I observed an n-times speed up for some numbers of thread(starting from thread number 2 to thread number 4). However, after using more than 4 threads the speed up was not steadily increasing.

C) The main reason is the number of physical cores that are available in the cpu, where number of cores is less than the number of threads that are available.

QUESTION 4

medium.txt			
#threads	Observed timing	Observed speedup compared to original	Expected speedup
Original program	17.5805	1.0	1.0
1	18.334	0.9562841530054644	1.0
2	9.3652	1.8817204301075268	2.0
3	6.2486	2.8006273405242776	3.0
4	4.6991	3.7241173841799498	4.0
8	3.3251	5.262999609034315	8.0
16	3.2610	5.366452008586323	16.0

hard.txt			
#threads	Observed timing	Observed speedup compared to original	Expected speedup
Original program	5.9800	1.0	1.0
1	6.2343	0.959209534350288	1.0
2	3.1910	1.87402068317142	2.0
3	2.1255	2.8134556574923546	3.0
4	1.6050	3.725856697819315	4.0
8	1.1323	5.281285878300804	8.0
16	1.1443	5.225902298348335	16.0

hard2.txt			
#threads	Observed timing	Observed speedup compared to original	Expected speedup
Original program	5.9887	1.0	1.0
1	6.2556	0.957334228531236	1.0
2	3.1867	1.8792795054445035	2.0
3	2.1300	2.8115962441314553	3.0
4	1.5056	3.977616896918172	4.0
8	1.1284	5.3072492024104925	8.0
16	1.0245	5.84548560273304	16.0

Based on the previous tables, it is not easy to get the expected speedup (same value exactly). In theory, yes we say that the program is going to be 4 times faster if we are using 4 threads. That means we will witness a speed up around 1/4 of the original one. In my code, when I use 1 thread, it was slower than the original because the original does not create threads and then join them at the end. In case of using 8 and 16 threads, there was no 8 or 16 times speed up because the cpu does not have 8 or 16 physical cores. If the cpu has 8 physical cores, the speed up would be around 8. When I tested the code with 2, 3 and 4 threads, there was a clear enhancement of the time taken to run the program.