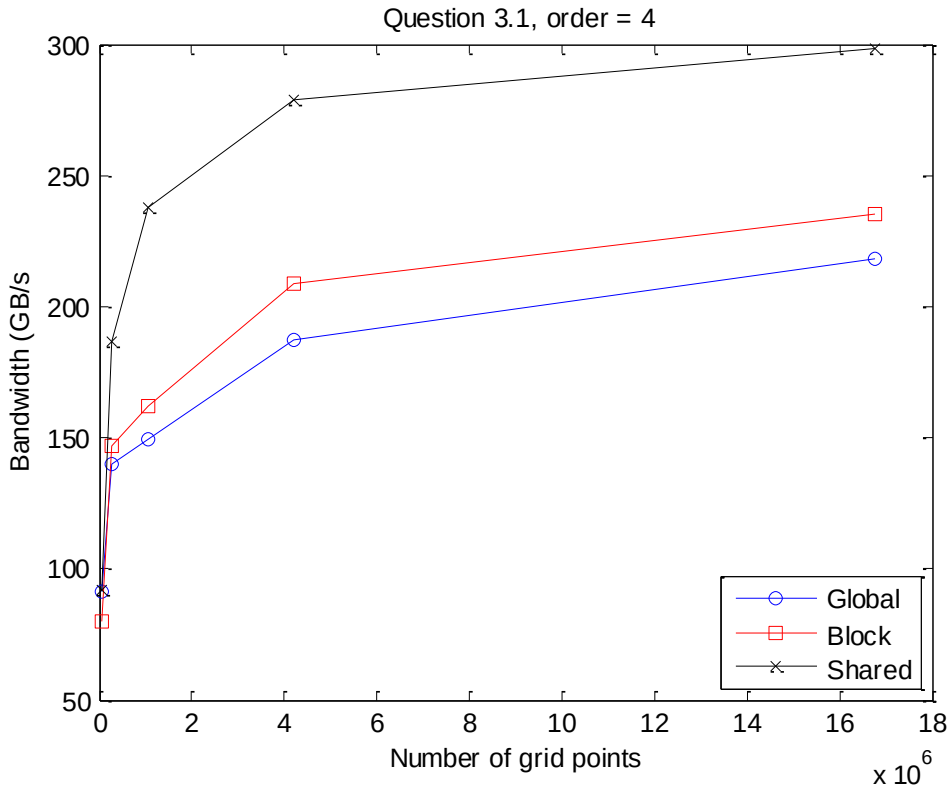
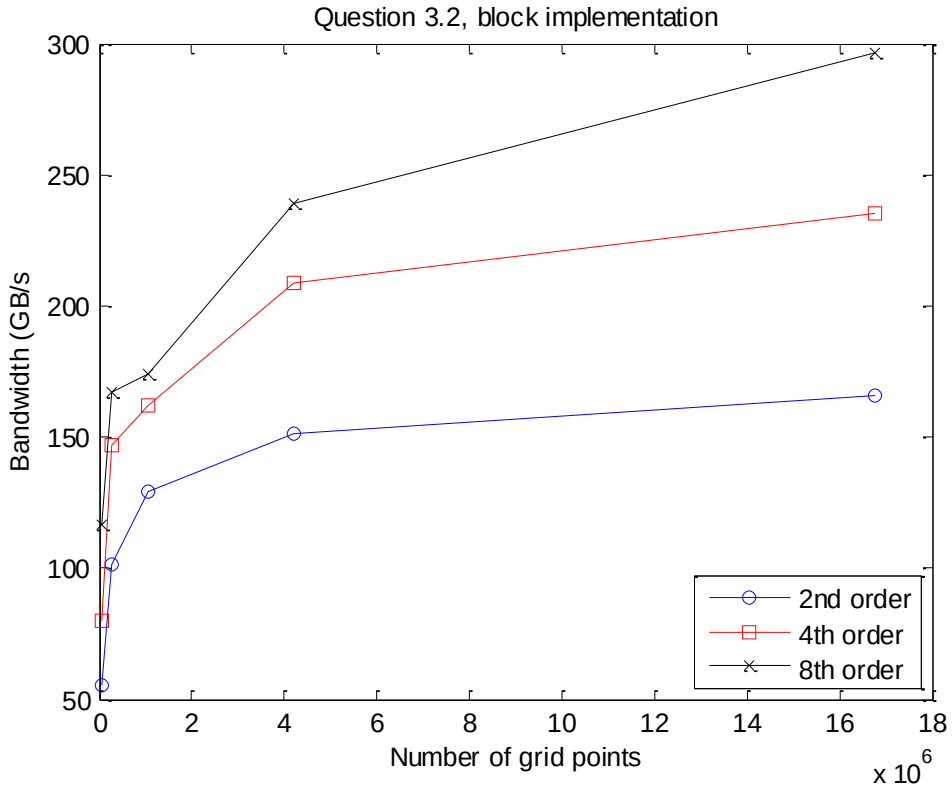
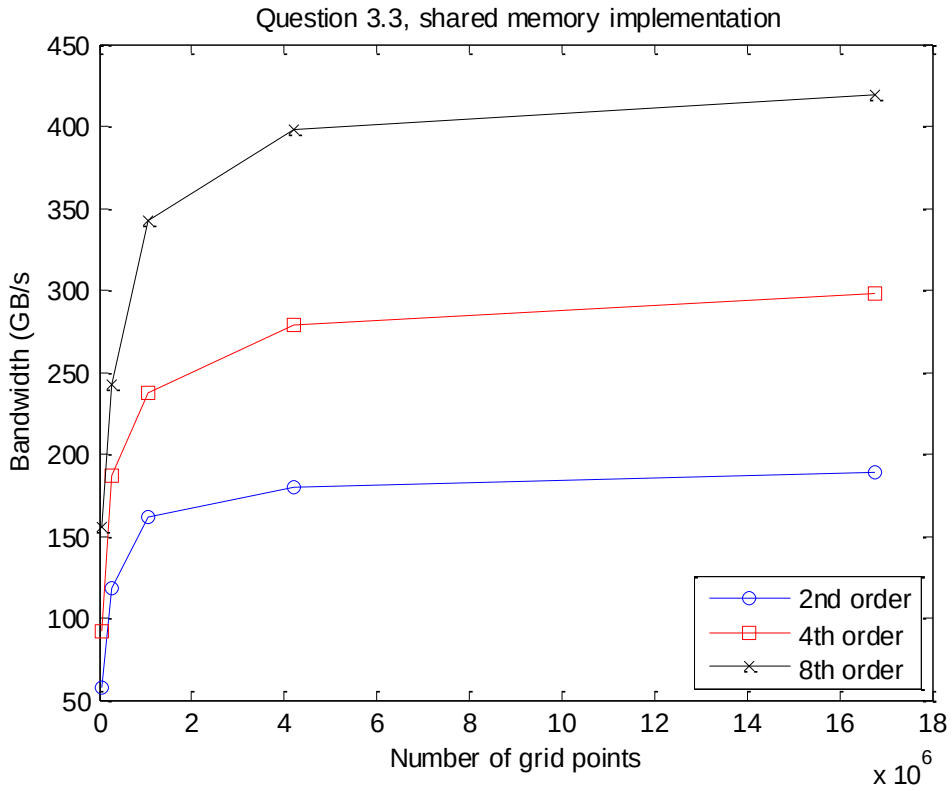
HW3 Writeup

Question 3







Question 4

It can be seen that shared kernel and 8th order scheme give the best performance.

8th order scheme gives the best performance because it takes more operations (more flops) to update the value of each grid point compared to 4th and 2nd order schemes. For the 8th order schemes, since there are more operations, threads are less likely to wait on memory for the problem so we can hide the latency better.

The block implementation has wider effective bandwidth compared to the global implementation because the block implementation can reuse the data already loaded in the cache for previous operations. In this problem, threads load data that can be reused for threads in the y-direction in the block implementation.

The shared memory implementation even has wider effective bandwidth compared to the block implementation because we can have better management on the shared memory compared to the management on cache. In the block implementation, we cannot guarantee that data loaded into cache is still there before it is reused but for shared memory, we are sure that data loaded will not be removed unless all threads in the same block have completed the algorithm in the kernel.

As also expected, when the size of problem is larger, the bandwidth also increases

because we need more blocks so we can hide the latency better.