The following data are obtained on my laptop with HDD and on CDF machine with SSD. The size of the file for reading/writing is 500MB.

2.2 Experiments:

a)

 From the results below, we could see that when we increase the block size from 100 bytes to something like 32768 bytes, the rate of write increased by a very significant amount. For HDD, the speed increases from 6567713 to 318471337, which is about 50 times faster. And for SSD, the speed increases from 123152709 to 4166666666, which is also about 40 times faster. And after that, the increasing in block size only increases the rate of writing slightly or no increase at all. With small block size, we need to wait for the I/O operations more often and each write is not fully utilized. And after 32kb, the increase is limited because we are reaching the top speed of our store medium, and 32 kb is a big enough block size to fully utilize a write.

b)

For HDD case, the strict optimal block size is 3000000 bytes. For SSD case, the strict optimal block size is one of 32768 bytes, 100000 bytes, 1000000 bytes. However, since the speed with block sizes more than 32748 is close and the speed would be different every time we run the script, I would say that there is no absolute optimal block size for reading in general.

c)

It is clear from that it is much faster to write into an SSD compare to an HDD. This is not surprising as the two medium suppose to be very different in terms of performance.

Block Size	HDD(bytes/sec)	CDF(bytes/sec)
100	6567713.1	123152709.3
256	12062726.1	287356321.8
1024	55248618.7	1020408163.2
4096	209205020.9	3571428571.4
16384	289017341.0	3125000000.0
32768	318471337.5	4166666666.6
100000	495049504.9	4166666666.6
300000	625000000.0	3125000000.0
1000000	641025641.0	4166666666.6
3000000	649350649.3	3333333333.3
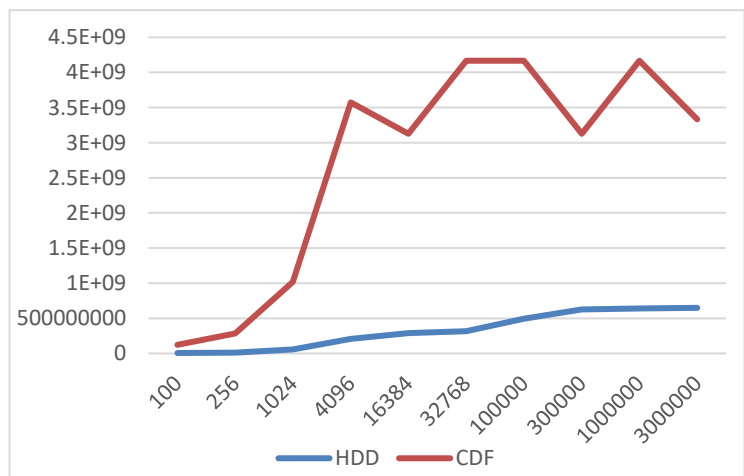
3.2 Experiments:

a)

The curve is very similar to the curve for writing except for the fact that the rate of reading is higher than rate of writing for all block sizes, which is expected. With smaller block sizes, the read is slow because we are not using every read efficiently and we need to wait for I/O more often. As we increase block size from 100 bytes to 32768 bytes, the speed increase by about 5-10 times. After that, when we increase the block size, the rate of reading just fluctuating up and down.

b)

Even though the highest rate of writing comes with block size of 1000000 for SSD and 3000000 for HDD, I would conclude that those are the optimal block sizes. The reasons are the same. As we repeat the experiment multiple times, we can observe that the rates are not constant. And the performance doesn't really changed a lot with block size beyond 32768 bytes. So there is no optimal block size in general.

c)

Again, the curves are similar. The only differences are that SSD reaches its top speed faster as we increase the block size, and overall, SSD's rate of reading is significantly higher than HDD's.

Block Size	HDD(bytes/sec)	CDF(bytes/sec)
100	70028011.2	1515151515.1
256	116009280.7	3571428571.4
1024	232558139.5	4166666666.6
4096	373134328.3	3846153846.1
16384	714285714.2	6250000000.0
32768	806451612.9	5555555555.6
100000	892857142.8	6250000000.0
300000	862068965.6	5555555555.6
1000000	892857142.8	7142857142.9
3000000	909090909.1	5000000000.0