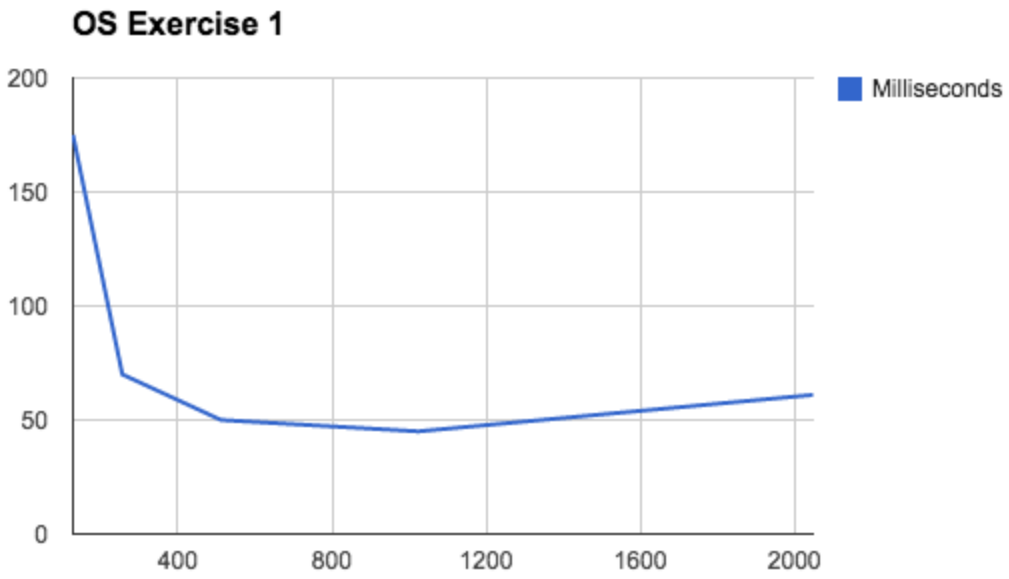
Exercise 1

Aviya Sela, ID 302221403

Part 2

1. Graph -



2. The running times are quicker as the buffer grows, thus making the graph as shown above, rather than a straight line. This is because in order to get the information from the file, the program calls the system to read from it, causing context switch in each call. The smaller the buffer size, the more system calls and context switch occur, so it takes more time.

3. Yes. Printing to the screen also takes a system call. Therefore, each time we read from the file we will initiate yet another system call, doubling the number of system calls. The smaller the buffer is, the more significant the number of system calls, thus doubling it makes the program significantly slower.

Part 2

1. False. In order to access the screen and print to it, a program needs the operating system, thus uses a system call.

2. False. Pressing a key on the keyboard will cause a hardware interrupt that is received at the CPU. Only then the CPU will call the system accordingly.

3. False. Interrupts are signals sent from external devices to the CPU and not vice versa.

4. False. The web browser runs in user mode, but in order to access many I/O components such as the screen or the mouse, it needs to call the system. System calls are exactly the way programs use to interact with these I/O components it cannot access on its own.

5. False. Only few applications run in kernel mode and in accordance with the OS creator preferences. All other programs run in user mode, e.g. web browser. This is to ensure a trustable, secure operating system.

6. False. The hardware interrupts reach the CPU directly. Only then the CPU informs the OS for the interrupt. The OS may choose to ignore them, but it cannot block them from reaching the CPU.

7. False. The virtual machine is in fact another layer between the software and the hardware: now we have VM → OS → Hardware rather than just OS → Hardware, thus making all operations run in greater-than-or-equal-to the normal running time.

8. False. Programs that need system resources such as the CD-ROM can still access them in user mode, using system calls.

9. False. The more system calls, the more context switch occurs, which makes programs run slower.

10. False. External devices does not reach the operating system directly. It is done through interrupts sent to the CPU, which then informs the operating system of them.