Lab 10: The /proc Filesystem

1. Is lack of change in system and user time in between sampling periods a guarantee that deadlock has occurred? Explain briefly.

- No. There is no guarantee whether or not deadlock has occurred with this method. If none of the threads have executed within the sample period, be it in user mode or system mode, it's very likely deadlock has occurred. When this happens (no execution in either mode), this means that the thread is waiting. However, as the sampling size becomes smaller, we run the risk of checking too fast. For example, we might check if a thread has had progress before that progress had been recorded (variable incremented). As mentioned in question two, we can only be sure after waiting for the maximum wait time after deadlock has been detected to know if it's actually happening. However, the program we've made here gives a good approximation since the times between checks for deadlock are 5 seconds apart.

2. What aspects of the system conditions would affect how long the sampling period should be to ensure a reliable assessment of whether deadlock has occurred or not?

- To ensure a reliable assessment, we would effectively want to wait for ACTIVE_DURATION * 9,999 cycles, because this is the maximum time a thread can take to eat, if the result of (rand() %10000) is 9999 (dp_thread() function). This would allow us to ensure that even if the longest time we could have waited for a chopstick to open up occurred, if deadlock was present before and after this amount of time, we would have deadlock. This could be hard to implement because we're dealing with a multi-threaded program. In this case (our program), we've allowed for enough time to pass

3. Informal experimentation tends to show that larger values of ACTIVE_DURATION make deadlock less likely, as indicated by how many sampling periods it takes to occur, and that smaller values make it more likely. Try a few different values yourself and then discuss whether you think this is true, and why you think it might have the influence you observe?

- After trying several test values for ACTIVE_DURATION, I have to agree with the claim that higher values of ACTIVE_DURATION do in fact make deadlock less likely. I think that this is the case simply because of the fact that philosophers finish thinking faster, causing them to request the left chopstick faster. Even though philosophers will eat faster as well, as soon as they put down their chopsticks, they will think relatively quickly and be ready to pick up their left chopstick once again. This would cause chains of left chopsticks to be grabbed, ultimately causing deadlock, like we've seen.