Quiz 3, CS 202(-001), Spring 2026

Please write your name below and answer all of the questions. The quiz has two sides.

Name: Net ID (@nyu.edu):

1. Consider the following command typed at the shell (the command is everything after the `$`). What does this command do?

```
$ ls > foo.txt
```

2. Consider this pattern, and assume that multiple threads are executing this code, where `lock_t` is a lock (or mutex).

```
lock_t L;

lock(L);

// in here are several lines of code

unlock(L);
```

   What guarantee does the programmer get from using `L` this way? Use no more than one sentence.

3. Recall the pattern from last class where a global variable `x` is initialized, after which one thread executes `f()` while another concurrently executes `g()`. Assume that pattern, and consider this code:

```
int x = 1;
f() { x = x + 2; }
g() { x = x + 3; }
```

   What are the possible values of `x` after `f()` and `g()` have finished executing? Circle all possibilities:

   1 2 3 4 5 6 7 8

4. Consider this code (read it carefully):

```
int x = 0;

int main() {

    tid tid1 = thread_create(f, NULL);
    thread_join(tid1);

    printf("%d\n", x);

    tid tid2 = thread_create(g, NULL);

    printf("%d\n", x);

    thread_join(tid2);

    printf("%d\n", x);
    return 0;  // not part of the program's output
}

void f() {
    x = 20;
    thread_exit();
}

void g() {
    x = 40;
    thread_exit();
}
```

Define a *trace* as everything that the program prints during a single execution (a trace will always consist of three integers). What are all possible traces of this program?

5. In the context of today's assigned reading, which of the following statements about condition variables are true?

Circle ALL that apply:

a Using a condition variable, a thread can enter a waiting state while atomically releasing a lock.

b A condition variable stores the value of a program condition that waiting threads later check.

c A condition variable is a synchronization primitive used to signal waiting threads when shared state may have changed.

d A condition variable is a synchronization primitive that evaluates to true when some condition is met.