1. How many lines of output does the following function print? Give your answer as a function of \( n \).

```c
void foo(unsigned n){
    for(unsigned i = 0; i < n; i++){
        fork();
    }
    printf("hello\n");
}
```

2. Consider the following program:

```c
void f(){
    printf("2");
}

int main(){
    int check = 0;
    if(fork() == 0){
        check = 1;
    }
    if(fork() == 0){
        printf("0");
    } else {
        printf("1");
    }
    if(check){
        f();
    }
    exit(0);
}
```

Which of the following outputs are possible:

(a) 112002
(b) 21120
(c) 102120
(d) 122001
(e) 100212
3. What are the possible output sequences from the following program?

```c
int main()
{
    if(fork() == 0){
        printf("a");
        exit(0);
    } else {
        printf("b");
        wait();
    }
    printf("c");
    exit(0);
}
```

4. Given the following jobs, compute the latency and response time for each job, along with the average response time, for FIFO, STCF, and RR scheduling algorithms. Assume a time slice of 10 for RR.

```
<table>
<thead>
<tr>
<th>Job</th>
<th>Length</th>
<th>Arrival Time</th>
<th>Latency</th>
<th>Response</th>
<th>Latency</th>
<th>Response</th>
<th>Latency</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>85</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>10</td>
<td>0</td>
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<td></td>
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<tr>
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<td>0</td>
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<td></td>
</tr>
<tr>
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<td>85</td>
<td>0</td>
<td>85</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

Average:

5. Consider a set of three jobs, A, B, and C, running concurrently on a computer system:

- Job A arrives first at time 0 and uses the CPU for 50ms before finishing.
- Job B arrives at time 1. Job B loops five times; for each iteration of the loop, B uses the CPU for 2ms and then does I/O for 8ms.
- Job C arrives at time 2. Job C is identical to Job B except for the arrival time.

Assuming there is no overhead to doing a context switch, identify when A, B, and C will finish for each of the following scheduling algorithms:

- RR with a 1ms time slice
- RR with a 20 ms time slice
- Multilevel feedback queue with four levels with a time slice of 10 in the highest priority queue, 20 in the next, 40 in the next, and 80 in the lowest priority queue. Priorities reset every 200ms.