CS 272/463 Running Time Name: Marco Gómez

1. What is meant by worst-case analysis?

Where the case with the most number of operations is used

2. For each of the following pieces of code answer the following two questions:

a) How many times *operation* is being executed? (Give the exact number)

b) What is the computational complexity (running time) of the piece of code in the big-O notation?

2.1

```
int i = 100;
while ( i > 0 ) {
    operation
    i = i – 1;
}
```

a) 100 b) $O(1)$

2.2

```
for (int i=0; i<n; i++)
    for (int j=0; j<n; j++)
        for(int k=0; k<n; k++)
            operation
```

a) n^3 b) $O(n^3)$

2.3

```
for (i=1; i<2*n; i++)
    for (j=1; j<n; j++)
        operation
```

a) $2n^2$ b) $O(n^2)$

2.4

```
for (i=n; i>1; i=i/3)
    operation
```

a) $\log_3(n)$ b) $O(\log n)$

2.5

```
for (int i=0; i<2*n; i = i + 2)
    operation
```

a) $\frac{2n}{2} = n$ b) $O(n)$

3. List the following formulas in order of running time analysis, from most preferred (fastest) to least preferred (slowest): $3n-2$, 7, $5n+n^2$, $3\log n$, 2^n, $10n^4$, $\sqrt{n}$, $3n^3-5n+n^4$.

$7, 3\log n, \sqrt{n}, 3n-2, 5n+n^2, 3n^3-5n+n^4, 10n^4, 2^n$