

CSE 3101, Summer 2010

Sample Test 1

May 13, 2010

1. (5 points) For the following functions $f(), g(), f(n) = o(g(n))$ or $g(n) = o(f(n))$. Determine which is true and justify your answer.

$$f(n) = 2n^2, g(n) = n \log n.$$

2. (10 points) Prove that the following algorithm for exponentiation is correct.

```
POWER( $y, z$ )
1 // return  $y^z$  where  $y \in R, z \in N$ 
2  $x \leftarrow 1$ 
3 while  $z > 0$ 
4   do  $x \leftarrow x * y$ 
5      $z \leftarrow z - 1$ 
6 return  $x$ 
```

3. (10 points) Analyze the running time of the following program for matrix multiplication.

```
MATMULT( $Y, Z, n$ )
1 // multiply  $n \times n$  matrices  $Y, Z$ 
2 for  $i \leftarrow 1$  to  $n$ 
3   do for  $j \leftarrow 1$  to  $n$ 
4     do  $X[i, j] \leftarrow 0$ 
5       for  $k \leftarrow 1$  to  $n$ 
6         do  $X[i, j] \leftarrow X[i, j] + Y[i, k] * Z[k, j]$ 
7 return  $x$ 
```