

# Quiz 3

TRUE/FALSE: Write “True” in each of the following cases if the statement is *always* true and briefly justify your answer. Otherwise, write “False” and provide brief reasoning.

1. [2] (HW4 §3.2 #2) The function  $5,000,000n^2$  is  $O(2^n)$ .

2. [2] (HW4 §3.2 #2) The function  $2^n$  is  $O(5,000,000n^2)$ .

Free Response: Show your work! No credit is given without supporting work.

3. Define the map  $f : \mathbb{R} \rightarrow \mathbb{Z}$  by  $f(x) = 3\lfloor x + 1 \rfloor$ .

(a) [2] (functions wks #2) Find  $f(\frac{3}{2})$

(b) [2] (functions wks #3) Find  $f(f(1.5))$ .

4. [3] (§3.3 #3) Give a big-O estimate for the number of additions and multiplication used in the below segment of an algorithm. Justify your answer.

```
t := 0
for i = 1 to 3 do
  for j = 1 to 4 do
    t := t + ij
  end
end
return t
```

**Algorithm 1:** Adding Multiples

5. [5] Write an algorithm that is big-O of  $n^3$ .

6. Recall that Binary Search is  $O(\log n)$  and that Bubble Sort is  $O(n^2)$ .

(a) [2] (HW4 §3.3 #4) How does the number of comparisons change in Bubble Sort when the inputs change from  $n$  to  $n^2$ .

(b) [2] (§3.3 #21) How does the number of comparisons change in Binary Search when the inputs change from  $n$  to  $n^2$ .