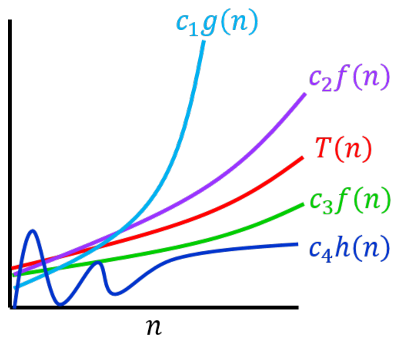
COSC 311: Algorithms
Mini 2

Due Wednesday, September 19 in class

1. Asymptotic comparisons. Order the following functions from slowest-growing to fastest-growing. Some of them may be equal (i.e., may belong to the same Θ class).

$$2n^2 \qquad 65n^{4321} \qquad \lg n \qquad 1700n \qquad 1.5^n \qquad n^3 + 4n^2 + 9000 \qquad n \qquad \frac{1}{1000}n^3$$

2. Analyzing algorithms. Suppose I wrote an expression, $T(n)$, for the runtime of my algorithm, and then I compared $T(n)$ to some other functions as follows:



Which of the following claims are true about the worst-case performance of my algorithm? (More than one claim may be true).

I. It's $\Theta(f(n))$.

II. It's $\Omega(h(n))$.

III. It's $O(g(n))$, provided $T(n)$ describes the runtime of the worst possible input.

IV. It's $O(g(n))$.

V. It's $\Theta(f(n))$, provided $T(n)$ describes the runtime of the worst possible input.

VI. It's $\Omega(f(n))$.

3. Writing recurrences. Here's an algorithm that you may (or may not) have seen before:

```
BinarySearch(A, x, i, j) // A is an array of length n
   if j < i return false
   mid = (i+j)/2
   if A[mid] == x return true
   if A[mid] > x return BinarySearch(A, x, i, mid-1)
   else return BinarySearch(A, x, mid+1, j)
```

Write a recurrence for $T(n)$, the runtime of `BinarySearch`. You do not need to solve your recurrence (but feel free to if you want the practice!)