CS 361, HW4

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Due: Sept. 29th

1. Consider the recurrence \( T(n) = 2T(n/4) + n^2 \)

   (a) Use the recursion tree method to get a tight upper bound (i.e. big-O) on the solution to this recurrence.

   (b) Now use annihilators (and a transformation) to get a tight upper bound on the solution to this recurrence. Show your work. (Note that your two bounds should match)

2. Consider the recurrence \( T(n) = 2T(n/2) + \log^2 n \)

   (a) Use the Master method to get a general solution to this recurrence.

   (b) Now use annihilators (and a transformation) to get a tight upper bound on the solution to this recurrence. Show your work. (Note that your two bounds should match)

3. Consider the following function:

   ```
   int f (int n){
      if (n==0) return 0;
      else if (n==1) return 1;
      else{
         int val = 6*f (n-1);
         val = val - 9*f (n-2);
         return val;
      }
   }
   ```

   (a) Write a recurrence relation for the value returned by \( f \). Solve the recurrence exactly. (Don’t forget to check it)

1
(b) Write a recurrence relation for the running time of $f$. Get a tight upperbound (i.e. big-O) on the solution to this recurrence.

4. Consider the following function:

```c
int f (int n){
    if (n==0) return 0;
    else if (n==1) return 1;
    else{
        int val = 4*f (n-1);
        val = val - 4*f (n-2);
        return val;
    }
}
```

(a) Write a recurrence relation for the value returned by $f$. Solve the recurrence exactly. (Don’t forget to check it)

(b) Write a recurrence relation for the running time of $f$. Get a tight upperbound (i.e. big-O) on the solution to this recurrence.