University of Nevada, Las Vegas Computer Science 477/677 Spring 2015

Assignment 4: Due March 3, 2015

Corrected Fri Feb 27 05:03:24 PST 2015

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. You may attach extra sheets, using a stapler.

1. Solve the recurrences. Give asymptotic answers in terms of n, using either O, Ω, or Θ, whichever is most appropriate. In each case show your steps. Explicitly shown any substitution you make. If you use the master theorem, the generalized master theorem, or the approximation of the derivative method, or, for that matter, any other method, specifically explain how you are using it.

   (a) $F(n) = 4F(n/2) + n^2$.

   (b) $G(n) \geq G(n-1) + \lg n$

(c) $H(n) \leq 2H(\sqrt{n}) + O(\log n)$.

(d) $K(n) = K(n - \sqrt{n}) + 1$.

(e) $F(n) = 4F\left(\frac{3n}{4}\right) + n^5$ (No, you don't need a calculator.)

(f) $G(n) = 2G\left(\frac{2n}{3}\right) + G\left(\frac{n}{3}\right) + 1$

2. Consider the following procedure:

```
void george(int n)
 {
  int m = n;
  while (m > 1)
   {
     for (int i = 1; i < m; i++)
      cout << "I cannot tell a lie.  I chopped down the cherry tree." << endl;
     m = m/2;
   }
 }
```

Consider the question of how many lines of output the execution of `george(n)` would produce. Write down an appropriate recurrence for this question, and give an asymptotic solution in terms of `n`, using either O, Ω, or Θ, whichever is most appropriate.

3. Consider the following procedure:

```
void tricky(int n)
 {
  for (int i = 1; i < n; i++)
    {
      for (int j = 1; j*j < i; j++)
      cout << "This is a tricky problem." << endl;
    }
 }
```

Consider the question of how many lines of output the execution of `tricky(n)` would produce. give an asymptotic solution in terms of `n`, using either O, Ω, or Θ, whichever is most appropriate. Show all your work.