## Question 5

According to the definition of asymptotically tight bounds. Let f and g are two functions

Then

* 1. Showing that for some positive number c and n > n0

taking logarithms for both equations.

The equation holds when

Set c = 1 then the equation would be

Now we apply L’Hopital’s rule to proof if the assumption is correct

= = = = 0

Therefore,

In addition, there is a fact which indicated that ***for every b > 1 and every x > 0, we have (algorithm design, Jon Kleinberg).*** Thus, when we compare these two equations:

It could be directly known .

* 1. Taking logarithms for both equations. We get:

For each these two equations, it could be seen that the definition of asymptotic upper bounds is not suit for f(n). There not exist constants c > 0 and n0 < 0 so that for all n >= n0, having T(n) <= c.

Therefore, neither of the two is the asymptotic upper bounds for each other.