Homework Assignment #2
Due: September 26, 2012

1. Review of asymptotic notation: Give formal proofs of the following statements, explicitly using the definition on page 277 (page 249 of the 2nd edition).

   (a) $2^n + 5320$ is $O(3^n)$.

   (b) $\frac{n^3+n^2}{n+12}$ is *not* $O(n^{1.9})$.

2. In class, we showed that any multi-tape Turing machine whose worst-case running time on inputs of size n is $T(n)$ can be simulated by a single-tape Turing machine whose worst-case running time is $O((T(n))^2)$.

   Tarmo claims that he has a better way of doing this simulation, so that the worst-case running time of the single-tape Turing machine will always be $O((T(n))^{1.5})$. Prove that Tarmo is mistaken.

   Hint: Your answer to this question can be very short if you make use of one of the results we proved in class.