Hints to Assignment 1

February 12, 2012

- **2-3** a. $\Theta(n)$, b. $\lceil \log k \rceil$ multiplications for x^k, hence $\Theta(n \log n)$ running time.
- **2-4** a. (2,1), (3,1), (8,6), (8,1), (6,1) b. Reverse sorted array $\frac{n(n-1)}{2}$ c. Running time = number of inversions d. In the merge routine, suppose array A is merged with B to get a new array C. Suppose $i > 0$ elements of A are yet uncopied. If, at this stage, and still the next element is copied from B, increase a counter by i. Keep the same global counter for all the calls to the merge routine.
- **3.1-1** $\max\{f(n), g(n)\} \leq f(n) + g(n) \leq 2 \max\{f(n), g(n)\}$
- **3.1-4** yes, no
- **3-2** $o, o, \text{none}, \omega, \Theta, \Theta$
- **3-4** F, F, T, F, T, T, F, T
- **4.1-6** $S(m) = 2S(m/2) + 1 = m = \log n$
- **4.2-4** $\Theta(n^2)$
- **4.2-5** $\Theta(n \log n)$
- **4.3-2** 48
- **4.4** c. $\Theta(n^2\sqrt{n})$, f. $\Theta(n)$, j. $\Theta(n \log \log n)$
- **6-2** a. child: $(i-1)d+j$ parent: $\lceil \frac{i-1}{d} \rceil$, b. height = $\lceil \log_d(n(d-1)+1) \rceil - 1$ (Yet to find out a better expression, if any.)
- **6-3** c. Move $\min\{Y[1,2], Y[2,1]\}$ to $Y[1,1]$ position, replacing the earlier entry by ∞. If $Y[1,2]$ is moved, the first row is completely sorted and we have to deal with an $(m-1) \times n$ tableau. Similar case for $Y[2,1]$. Recurrence: $T(p) = T(p-1) + \Theta(1) = \Theta(p)$

  d. Insert the new element at $Y[m,n]$ and follow a procedure similar to c. above.

  e. Insert all the elements into a $n \times n$ Young's tableau and perform n^2 extract-min operations as in c. above.

f. Check the last element of the first row. Either the first row or the last column is eliminated.

- **8-6** d. Worst-case: Each of the lists contain alternate elements from the sorted list.