CIS 621: Algorithms and Complexity
Winter 2008

Assignment 3

due Wednesday, February 20, 2008

1. Given n pairs $(x_0, y_0), (x_1, y_1), \ldots (x_{n-1}, y_{n-1})$ we want to find a polynomial $A(x)$ such that, for all i, $A(x_i) = y_i$. As mentioned in class, Lagrange's formula gives us a way to determine A:
$$A(x) = \sum_{k=0}^{n-1} y_k \frac{\prod_{j \neq k}(x - x_j)}{\prod_{j \neq k}(x_k - x_j)}.$$
Show how to find A in time $O(n^2)$.

2. chapter 5, exercise 3, pp 246-247

3. **(extra credit)** Modify the `Recursive-Multiply` algorithm on page 233 to break the integers x and y into three sections, and use 5 (or 6?) multiplications of $n/3$-bit integers to compute $x \cdot y$.

4. chapter 6, exercise 1, pp 312-313

5. chapter 6, exercise 6, pp 317-318

6. chapter 6, exercise 19, p 329