Due at the start of class Wed, Mar 16, 2011.

**Problem 1.** Prove (using induction) that for all $N \geq 1$ the following holds:

$$
\sum_{i=1}^{N} i^2 = \frac{N(N+1)(2N+1)}{6}.
$$

**Problem 2.** Write (and submit) a ruby program to do Bubble Sort. If you are not sure about how Bubble Sort works, look it up. You have to test your program and show some sample inputs on which it was run.

**Problem 3.** Why do you think the running time of an algorithm is important?

**Problem 4.** (Please write between 400 and 600 words.) Describe some cool application that you have observed while using some software. Discuss what algorithms might have been developed and used there. Example: search engines may correct your spelling mistakes – for example if I google “Madona”, it asks me “Did you mean: Madonna”. How did it figure this out? Please do not re-use the same example!