

## Homework 2

**Due date: Tuesday**, February 17, by 5 PM.

Put your homework in the envelope on my door if I am not there.

All written homeworks are due at the beginning of class on the due date. There is no provision for homework turned in late. Write your answers on plain or lined paper. Show your work for maximum (partial) credit. **Be as neat as possible**; if I can't read it or can't follow it, it's wrong. If your homework is longer than one page, please staple or paper-clip the pages together.

At the end of your homework, please write and sign the Honor Code pledge:

**I have abided by the Wheaton College Honor Code in this work.**

1. Text question 9 on page 52.
2. Text question 5 on page 60.
3. Text question 7 (b) on page 60.
4. Show that  $2n^2 + 4n + 10 = O(n^2)$  first using the original (formal) definition of Big O and then using L'Hôpital's and the limit rules.
5. For each pair of functions,  $T(n)$  and  $f(n)$ , determine which of the following (sometimes more than one) hold:

$$T(n) = O(f(n)), \quad T(n) = \Omega(f(n)), \quad T(n) = \Theta(f(n))$$

**Justify your answer** (this means “**prove**”).

- (a)  $T(n) = 5n, f(n) = n$
  - (b)  $T(n) = n^2 \log_2 n + n^2, f(n) = n^3$
  - (c)  $T(n) = \log_2(n^k), f(n) = (\log_2 n)^k$  (Assume  $k$  is a constant and  $k > 1$ )
6. Give the best possible Big O estimate for  $T(n)$ :
    - (a)  $T(n) = (n^4 + 10n^2) \cdot (n^3 \log_2 n + 20n^4)$
    - (b)  $T(n) = \sum_{i=1}^n 5i(i-1)$