This homework must be completed and submitted electronically. Formatting standards, submission procedures, and (optional) document templates for homeworks may be found at

http://classes.engineering.wustl.edu/cse241/ehomework/ehomework-guide.html

Advice on how to compose homeworks electronically, with links to relevant documentation for several different composition tools, may be found at

http://classes.engineering.wustl.edu/cse241/ehomework/composing-tips.html

Please remember to

• typeset (do not hand-write) your homework’s text;
• create a separate PDF file for each problem;
• include a header with your name, WUSTL key, and the homework number at the top of each page of each solution;
• include any figures (typewritten or hand-drawn) inline or as floats;
• upload and submit your PDFs to Blackboard before class time on the due date.

Always show your work.
This introductory homework gives you a chance to get used to electronic composition with the tools of your choice and submission of PDFs through the Blackboard interface. If you can do the simple typesetting exercises below, you are 90% of the way to knowing all the typesetting you need for this class.

The approximate weights of each problem (out of 100%) are given in parentheses, but things that come up in the course of grading may cause these weights to be adjusted.

Unless otherwise noted, all occurrences of “log” refer to the base-2 logarithm.

1. (50%) Using the word processor or editor of your choice, reproduce, as closely as you can, each of the following quoted blocks of text. Your version must communicate the same information as my original and must use symbols and math typesetting where appropriate, but of course, it doesn’t have to be pixel-for-pixel identical (especially the pseudocode).

(a) “The Blort-Search algorithm runs in time $\Theta(n^2)$, while the Foo-Search algorithm runs in time $O(n \log n)$ but is faster in practice only for $n > 10000$. Do not use Stupid-Search, which is $\Omega(n^5)$.”

(Tip: for faster composition in the future, figure out how to type the above example without having to touch the mouse or trackpad.)

(b) “It can be shown that for $\epsilon > 0$,

$$\lim_{n \to \infty} \frac{n \log(n)}{n^{1+\epsilon}} = 0.$$ 

Moreover,

$$a^{\log_b n} = n^{\log_b a},$$

which is useful in recurrence analysis.”

(c) “One way to code the Binary-Search algorithm is as follows:

```
Bsearch(x, A, p, r)
    if p = r
        if A[p] = x
            return p
        else
            return notFound
    else
        mid ← ⌈(p + r)/2⌉
        if A[mid] > x
            return Bsearch(x, A, p, mid - 1)
        else
            return Bsearch(x, A, mid, r)
```

This is one of many correct versions of the algorithm.”

(Tip: if you use LaTeX, grab the example document from the composing tips page and look at the pseudocode example. For other editors, try a fixed-width font such as Courier and insert inline math where needed.)

2. (50%)

(a) Draw a figure showing a doubly-linked list containing three items, each of which holds an integer value. Label the head and tail of the list. Then draw an array containing the same three integer values in the same order.
(b) Draw a table comparing the values of the functions $f(x) = x \log x$ (to the nearest integer) and $g(x) = x^2$ for the following values of $x$: 1, 10, 100, 1000, 10000, and 100000.