COS126: General Computer Science	Spring 1996

Exercise # 4

Handed out:March 14, 1996

These exercises are meant to guide class discussion and to help you prepare for exams. *Do not* turn in solutions.

1. What is wrong with the following declaration?

```
struct element { float f; struct element link; };
```

2. (This question assumes that you know about complex numbers; skip it if you don't.) A *complex number* is written as $a + bi$, where a, b are real numbers, and $i = \sqrt{-1}$. Given two complex numbers $a + bi$ and $x + yi$, their *sum* is $(a + x) + (b + y)i$, and their *product* is $(ax - by) + (ay + bx)i$.

   Define a structure for representing complex numbers, and write two functions `sum` and `product` that do arithmetic on complex numbers. The functions should take two complex numbers as inputs and return a complex number.

3. What does the following program print?

```
#include <stdio.h>
int f(int *x)
{
  *x = *x+1;
  return *x;
}
void main()
{
 int i =5, j;
 j = f(&i);
 printf(``%d, %d'', i, j);
}
```

4. What do the following declarations do?

```
int x, *y, **z;
struct a {int *b; struct a *c;};
```

5. What happens when you run the following program?

```
#include<stdio.h>
#include<stdlib.h>
void main()
{ int i=1, *x;
  while (i!= 0)
    x = malloc(sizeof(int));
}
```

6. Suppose the `node` and `list` structures are defined as in the lecture nodes. Modify the `addto()` function given in the lecture notes so that it adds a new node between the first and second nodes of the list.

7. What does the following postscript program do?

```
%!
200 200 moveto
200 300 lineto
200 300 moveto
300 300 lineto
300 300 moveto
300 200 lineto
300 200 moveto
200 200 lineto
stroke
showpage
```