Practice Problems for Week 2

Operating and Systems Programming 2022/23

For all questions involving code, try to answer them *without* running the code first.

1. Describe the differences between local, heap, global and static variables.

2. With an example, describe how stack frames are created and destroyed during function calls.

3. Describe the consequences of returning a pointer to a local variable from a function call. Give an example.

4. Describe the differences between pass-by-value and pass-by-reference.

5. What is wrong with this program?

```
int *max(int*a, int*b){
    int temp;
    if(*a >*b)
temp=*a;
    else
temp=*b;
    return &temp
}
int main(){
    int a=4,b=5;
    int*c;
    c=max(&a,&b);
    printf("Max value=%d",*c);
    return 0;
}
```

6. The following unfinished C program declares an array of four pointers in line 5. Using nested for loops with counters i and j, complete the unfinished program to construct the two-dimensional matrix

```
 0    1    2    3
 4    5    6    7
 8    9   10   11
12   13   14   15
```

such that p[i] points to the i-th row of the matrix.

```c
#include <stdio.h>
#include <stdlib.h>
int main () {
    int i, j;
    int *p[4];

    /* your code */
    return 0;
}
```

7. What is wrong with these function calls?

```c
int * foo1 () {
   int x = 20;
   return &x;
}

int *foo2 () {
   int *p;

   *p = 20;
    return p;
}
```

8. Does this program leak memory?

```c
int main(){
    int *p;
    p = (int*)malloc(sizeof(int));
    *p = 6;
    printf("%d",*p);
    return(0);
}
```