CSSE 132 – Introduction to Systems Programming
Rose-Hulman Institute of Technology

Worksheet 16 Advanced Heap

Name (Print):_____ RHIT Username:_____

1. Given a pointer variable, we can use type casting to convert the pointer to a different type of pointer. For example, assuming `xp` is an integer pointer (i.e., `int*`), you can use the code below to convert it to a character pointer.

```
int x = 0x41424344;
int* xp = &x;
char* cp = (char *) xp;
for(int i = 0; i < 4; i++)
  printf("%c", cp[i]);
```

   In this case, since the size of `int` is four bytes, we can use `cp` to access this four-bytes number *as if it is an array of four characters*. Given this, what do think the code above will print out? (Note: Assume the computer here uses Little Endian.)

2. In this part, we will allocate space for a 2D array (`nrows` × `ncols`) of `int`s on the heap, using separate allocations of each row. The goal is to set things up so that `array[i][j]` would be the entry at row `i`, column `j` of the array.

   (a) First, diagram how this looks in memory using the pointer notations.

   (b) Now, complete the code that would allocate this.

```
#include <stdlib.h>

int** My2DAlloc(int nrows, int ncols) {




}
```

3. Now, we still want to allocate a 2D array of `int`s on the heap, but we want to do it by only calling `malloc` once, i.e., allocating all the memory in a single block.

   (a) Diagram how this looks in memory using the pointer notations.

   (b) Complete the code that would allocate this.

```c
#include <stdlib.h>

int** My2DAllocOneMalloc(int nrows, int ncols) {









}
```

4. **Reflection:** What is one thing from this topic that you found interesting, OR what is one question you are now curious to learn more about?