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Task 1

This program sorts an array of random integers, arranging even numbers in descending order, followed by odd numbers in ascending order. It does this through a comparator function that applies the specified sorting logic. Once sorted, the program displays the array in its new order on the console.

```
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> gcc -o task1 task1.c
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> ./task1
The sorted array is: 12 10 8 6 4 2 0 1 3 5 7 9 11 13
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> █
```

Task 2

I created a function factorial that takes an integer as input and calculates its factorial. In main, a function pointer calc, is designed to point to any function accepting an integer and returning an integer. Factorial's address was then assigned to calc. Using calc, the factorial function was called with a parameter of 5 and 10, and the result was printed out.

```
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> gcc -o task2 task2.c
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> ./task2 5
120
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> ./task2 10
3628800
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> █
```

As we increase the factorial from 12! to 15!, the integer returned grows very significantly. To combat possible overflow errors, we can use larger data types, possibly long ints.

Task 3

In this program, the stk_toString function generates a string representation of the stack's contents, separating elements with commas. It starts with a buffer of 1024 characters, expanding it as needed by doubling its size whenever additions exceed its capacity. The function uses realloc to adjust the buffer size and frees items after adding them to the string.

```

PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> gcc -o cstktest2 cstktest2.c cstk.c
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> ./cstktest2
All non-display tests passed!
You should now see the numbers from 0 to 9:
0, 1, 2, 3, 4, 5, 6, 7, 8, 9

You should now see the string: [Max Bender: 10, Stephanie Taylor: 100]
Max Bender: 10, Stephanie Taylor: 100

PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25>

```

```

PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> gcc -o toDraw2 toDraw2.c cstk.c
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25> ./toDraw2
Stack is located at: 0x7ffffcbe8
i is located at: 0x7ffffcbe4
Stack starts at: 0xa00000450
Account struct is located at: 0x7ffffcbd0
PS C:\Users\veerk\Desktop\CS333\Project4_vakhos25>

```

