CPE 360 Midterm — Dominic Zecchino

1. Using the heap allows for the assigning of application space to spread out portions of memory as opposed to designated memory next to each other.

For example, in class we discussed the usage of 3 applications in contiguous space. If we have 2 applications that work at 40% of the memory space each, and 1 that runs at 30%, if we open one application that runs at 30% and then one that runs at 40%, even if we close the 30% application, we would not be able to open the other 40% application. This is because we would have 30% of free space at the front of the memory and 30% at the back of the memory. Those two sections do not combine to form 60% of available memory, only 2 30% sections.

2. a) $3n^2 + 4n^3 + 5 = O(n^2)$

$\lim_{n\to\infty}(4n^3) \geq \lim_{n\to\infty}(C \cdot n^2)$ False

b) $8\log n + 4n = O(n)$

$C \geq 5$ $\lim_{n\to\infty}(4n) \leq \lim_{n\to\infty}(C \cdot n)$ when $C \geq 5$

True

c) $2^n + 4n^3 = O(n^3)$

$\lim_{n\to\infty}(2n) \geq \lim_{n\to\infty}(C \cdot n^3)$ False

d) $2n^2 + 3n = \Theta(n^2)$ True

$C_1 = 1$ $C_2 = 3$ $\lim_{n\to\infty}(n^2) \leq \lim_{n\to\infty}(2n^2) \leq \lim_{n\to\infty}(3n^2)$

e) $2^n + n^2 + O(n) = O(n^2)$ False

$\lim_{n \to \infty} (2^n) \geq \lim_{n \to \infty} (C \cdot (n^2 - n))$

3.

```
#include <iostream>
using namespace std;
int sum=0, num0=0, num1=1;

int getNthTermFibonacci(int n) {

    if(n==1) {
        cout << num0 << " ";
    }
    else {
        sum = num1 + num2;
        cout << num1 << " ";
        num1=num2;
        num2 = sum;
        getNthTermFibonacci(n-1);
        return num2;
    }
}
```

4 a+b*(c-d)/f

Next Symbol Read	Stack Contents	Postfix Expression
a	Null	a
+	+	
b		ab
*	* +	
(	(* +	
c		abc
-	- (* +	
d		abcd
)		abcd-*+
/	/	
f	/ ← popped immediately after	abcd-*+f
Null		abcd-*+f/