Homework 8

Abhi Agarwal

1 Basic Blocks

1.1 Question 1.1

What are the basic blocks in the program? I'm using the dragon book page 527.

1: i = 1
2: h = 1
3: goto 11

4: s = h
5: h = s + i
6: i = s
7: a = a - 1
8: goto 11

9: f = h
10: return

11: if a>0 goto 4

12: goto 9

1.2 Question 1.2

Can you simplify the code? I'm using the dragon book page 533 to help eliminate most of the jumps. The return value is f so I'm going to assume this. To account for this I'm replacing h with f as when we return it's going to return the f value, and so it helps eliminate the 9th and 10th jump. So the 9th, and 10th jump can be eliminated and changed here. We can be checking using the 11th statement, and then looping back to 4 if $a > 0$, and returning if not.

1: i = 1
2: f = 1
3: goto 8

4: s = f
5: f = s + i
6: i = s
7: a = a - 1

8: if $a > 0$ goto 4

9: return

1.3 Question 1.3

What well-known function f of n does the code compute? Explain in detail how; for full points use a formal induction argument.

The algorithm starts off with $i = 1, f = 1$, and then in the while loop the condition is $a > 0$. In the body we set s to f, $f = s + i$, and then set $i = s$, and then we want to decrement a with 1. This particular function computes the nth fibonacci number in the fibonacci sequence - $F_n = F_n - 1 + F_n - 2$. The same thing occurs in this case, but we set the previous value to be i.