Formula

Makefile

The makefile contains everything that's needed to create the formula executable. The object file is created with the –Wall –m32 flags since the .s file is a 32 bit file. This forces the gcc compiler to compile using x86 32 bit code which is what the .s file is in.

Analysis

nCr.s was written in C then optimized. It was then linked to formula.c which calls the functions in it. Factorial runs in O(n^2) time since each call to the factorial function is a recursive call.

While nCr.s is not able to detect overflow conditions, formula.c is able to detect these conditions. When Formula.c detects that the number inputted might be overflow, it outputs "0" and exits. It will return an error if a negative number is inputted or any non-numeric char is inputted with the exception of the help(-h) flag.

The way (1 + x)^n is printed is that once it makes sure that there is a valid input, if n>0 it will first print out (1+x)^0 = 1, Then it enters a for loop that constantly calls nCr and calculates the coefficient then prints it out along with it (1+x)^k where k is the current iteration of the loop is also printed out. If it's not the last iteration then a + sign is printed in the same line.

Formula also uses gettimeofday() to calculate the runtime.

Challenges

Since I was writing the code in C instead of assembly, I couldn't use the overflow flags. So in order to mediate this, I looked for the largest factorial value that I can use without overflow which was 12! And coded that into one of the checks in the formula source file.