How to do a GW run:

1. **Single Point with Plots**
   a. Open the file 'Plotter.py'
   b. At the end of the file, after *'if __name__=="__main__":'*, you can run *'print(populateN(m2,c,ls,la,N,F,print=True))'* (Normal case) and *'populateIN(m2,c,ls,la,N,F,print=True))'* (large N case) to add AMSB soon. This will go through the entire phase transition process with plots at each important step so you can keep an eye on the numerics.
   c. If you also want to check how it's done finding the critical temperature, on line 365 of 'Potential2.py', change *'prnt=True'* in the function argument for *'criticalT'*. Make sure to turn this back later.
   d. At the end of the run, it will print for you *(Tn, alpha, Beta/H, vw=1, Tc, message)* (message is a diagnostic if the run failed, see 'messages.txt').

2. Multiple Points in Parallel

a. Open the file 'Plotter.py'
b. Change the global variable *'CORES'* to how many CPU cores you want to run the scan.
c. The function *'ParallelScan'* requires 4 lists of effective masses for each particle type. It also needs a number of colours N and flavours F. Input these below *'if __name__=="__main__":'*.
d. It is also important to set up the scan properly so it doesn't try to plot things. Ensure on *line 365 of Potential2.py* that *'prnt=False'* in the argument for the function 'criticalT'. Also alter *'counter'* on line 375 which will set how many failed dressed mass points are allowed within 20% of the critical temperature. Do adjust as necessary. Later I may write a program to try to be accepting of corners of parameter space which have failed if needed.
e. The scan will run through the given effective masses at T=0 GeV, both for the large N case and for the normal case. (AMSB case not implemented but easy to achieve).
f. At the end of the scan, the normal and largeN limit case will save in *'Test_N3_F6_Normal.csv'* and *'Test_N3_F6_largeN.csv'*.
g. Check the message column to decipher if any points have failed in unexpected ways. These may need individually re-running. I have made an error message table in 'messages.txt' in the GitHub.
h. run *'DifferencePlot.py'* to see the change in alpha and beta/H point-by-point, and 'SensitivityPlotter.nb' to see the GW spectrum.
i. If you want to compute the wall velocity, there are two codes to do this. One is called '*WallVelocityLargeN.py'* the other is *'WallVelocity.py'.* These will modify your csv files so there is a column for the large N (2312.09964) & local thermal equilibrium (2303.10171) estimates for the wall velocity. NOTE the number of degrees of freedom is incorrect for both of these codes. A future job is to correct them later.

REMEMBER if you want to run a scan with a new number of colours N and flavours F, you should also consider the Polyakov loop improvement which may need re-running. Ask Martha about this. Also check the interpolator & max cutoff is correct.

Please let me know if any of this is unclear and/or breaks.