For problem 1 I got the following outputs for call and put on black scholes:

```
AAPL_Put_Premium_Value 13.745361593880062
AAPL Net Delta Exposure:  -0.9165496333661425
AAPL Net Gamma Exposure:  0.016822916101852648
AAPL Net Theta Exposure:  -0.005317784872060155
AAPL Net Vega Exposure:  0.06938710929513443
AAPL Net Rho Exposure:  -0.1375800312273579
AAPL Net Carry Rho Exposure:  -0.1251527180054937
AAPL Net Charm Exposure:  -0.0036180572144972013
AAPL Net Vanna Exposure:  0.011041137391941661
```

```
AAPL_Call_Premium_Value 0.3357989976315192
AAPL Net Delta Exposure:  0.08297130333914773
AAPL Net Gamma Exposure:  0.016822916101852648
AAPL Net Theta Exposure:  -0.022264444821010514
AAPL Net Vega Exposure:  0.06938710929513443
AAPL Net Rho Exposure:  0.01102593915636819
AAPL Net Carry Rho Exposure:  0.01132953825011723
AAPL Net Charm Exposure:  -0.003603543622813535
AAPL Net Vanna Exposure:  0.011041137391941661
```

For the Binomial Tree I got the following Prices for put and call with dividend and no dividend:

```
Option price call no div: 0.34
Option price put no div: 14.02
Option price put with div: 13.97
Option price call with div: 6.77
```

It seems that the Call side is way more sensitive with dividend on the black scholes than the put side is. I'm not 100% sure if the call side with div is accurate but based on the results there is high sensitivity on Call side. This is most likely due to the div reducing price of stock and affecting path of final price.

With problem 2, I tried running the code for week 6 and I still cant figure out what is breaking in my code which makes it hard to do week7 problem 2 due to BSMerton codeso I will take point deduction accordingly.

For problem 3 I got the following weights for the super efficient portfolio with a sharpe ratio of 1.9776

```
Super efficient portfolio weights:
AAPL: 0.00000000
META: 0.00000000
UNH: 0.82698586
MA: 0.00000000
MSFT: 0.00000000
NVDA: 0.00000000
HD: 0.00000000
PFE: 0.00000000
AMZN: 0.00000000
TSLA: 0.00000000
GOOGL: 0.00000000
BRK-B: 0.00000000
JPM: 0.00000000
JNJ: 0.00000000
PG: 0.07752476
V: 0.00000000
DIS: 0.00000000
BAC: 0.00000000
XOM: 0.00447762
CSCO: 0.09101176
```