Github: https://github.com/yship1002/ISYE6227
For problem 1 part a:
I plot 21 pairs of return vs risk. Majority of stock is in the lower left corner of the quadrant except very few outliers.

For problem 1 part b:
It is shocking to see a few porfolio has such bad performance when 500 random portfolios are generated with any weights. I plot feasible region (below blue dots) by solving a series of optimal portfolio problem (using a series of lagrangean multipliers)using the demo code posted on canvas.

For problem 1 part c:
This time feasible region are generated with only positive weights so it is more curvy than one with any weights. It shows that by placing extra constraint such as only positive weights feasible region shrinks.

For problem 2 part a:
i first use the optimal_portfolio function in demo code to get weights then compute portfolio expected return and risk.
Annual Expected return of portfolio x: 0.6925204638028941
Risk of portfolio x: 1.0266034586276869
Annual Expected return of portfolio y: 0.1093665521804133
Risk of portfolio y: 0.15046642120835088
I think whether x or y perform better depends on what criteria used. If using sharpe ratio then y is better but if you want best expected return then x is better.

For problem 3 part a/b:
I tried all combinations of n,m and found n=5,m=6 is the best with highest expected return
Selected portfolio expected return annual : 0.46008087055139735
Selected portfolio risk annual: 0.30855710280026355
Equal weighted portfolio expected return annual: 0.1332650085768895
Equal weighted portfolio risk annual: 0.012302059138691012
I think whether x or y perform better depends on what criteria used. If using sharpe ratio then y is better but if you want best expected return then x is better.