Problem 1

Greeks for Call Option:

```
'delta': 0.5134924341675868,
'gamma': 0.04018251491006158,
'theta': -0.06049658790492133,
'vega': 0.1978135668935456,
'rho': 0.07300692770779327}
```

Greeks for Put Option:

```
'delta': -0.4865075658324132,
'gamma': 0.04018251491006158,
'theta': -0.05936670633167526,
'vega': 0.1978135668935456,
'rho': -0.07613743996068799}
```

Price for Call & Put Options (respectively):

```
callp, putp
```

```
(3.230683995715243, 4.141876902240273)
```

Conclusions:

- Put options become more expensive since the price will drop by the amount of the dividend
- Call options become cheaper due to the anticipated drop in the price of the stock
- The value of put option respond less than call option to a price change as the absolute value of delta(put) < delta(call)

Problem 2

I was not entirely sure about how to use the formula you provided with gradient to calculate delta normal VaR. And it took me too long to figure out problem 1 and 3. I will try and figure out this problem on my own next week.

Problem 3

Expected Returns:

	AAPL	FB	UNH	MA	MSFT	NVDA	HD	PFE	AMZN	BRK-B	PG	XOM	TSLA	JPM	V	DIS
0	0.012163	0.012056	0.012147	0.012016	0.012136	0.011982	0.01206	0.012236	0.012054	0.012146	0.01216	0.012022	0.012061	0.012072	0.01205	0.01212

GOOGL	JNJ	BAC	CSCO
0.01209	0.012162	0.012051	0.012196

Optimized efficient portfolio weights for 20 stocks:

```
 0.75618169, -0.24243637,  0.75618129, -0.24243734, -0.24243439,
-0.24243817, -0.24243628,  0.75618349, -0.24243641, -0.14073608,
 0.7561816 , -0.24243721, -0.24243625, -0.24243598, -0.24243651,
-0.2424348 , -0.24243555,  0.75618164, -0.24243648,  0.75618248]
```