Paid Search Bid Optimization Exercise

Part A:

	alpha	beta
kw8322228	74.090752	0.039449
kw8322392	156.440066	0.150082
kw8322393	104.799452	0.079716
kw8322445	188.111789	0.432290

Part B:

	best_bid	optimal_profit	expenditure
kw8322228	34.127591	3950.455944	1870.612408
kw8322392	13.563468	6032.906981	1844.759679
kw8322393	22.433898	5451.616671	1957.878044
kw8322445	5.816973	4544.196407	1005.723771

Part C:

Total Profit: 17925.840262090685

	bid	expenditure	profit
kw8322228	17.924232	673.207331	3315.505798
kw8322392	8.118453	894.507387	5487.233664
kw8322393	12.828285	860.884937	4836.613142
kw8322445	3.775705	571.400340	4286.487659

Optional
Part D:

	alpha	beta	ltv	best_bid
kw8322445	188.111789	0.432290	107	5.816973
kw8322392	156.440066	0.150082	181	13.563468
kw8322393	104.799452	0.079716	283	22.433898
kw8322228	74.090752	0.039449	354	34.127591

We can see that:
i) ltv is inversely proportional to alpha

ii) ltv is inversely proportional to beta
iii) ltv is proportional to best_bid

Intuitively, it makes sense that alpha and beta is inversely proportional to ltv as if the lifetime value of a customer is less, then the value where number of clicks would stagnate would also be at a higher range. The best bid would obviously be high for the keyword which has a better lifetime value.

Part E:

Keyword kw8322445 has the least reduction after adding the constraint.The reason for this could be due to the fact that the best_bid and optimal profit for this keyword was already less. This might signify that the keyword is not suitable for our use-case. Additionally, this can be verified by looking at the LTV. For this keyword, the LTV is also the least.