1)

```
Cost  for Theta 1 -> 0
Cost for Theta 2 -> 8.4375
Cost for Theta 3 -> 1.4375
```

2)

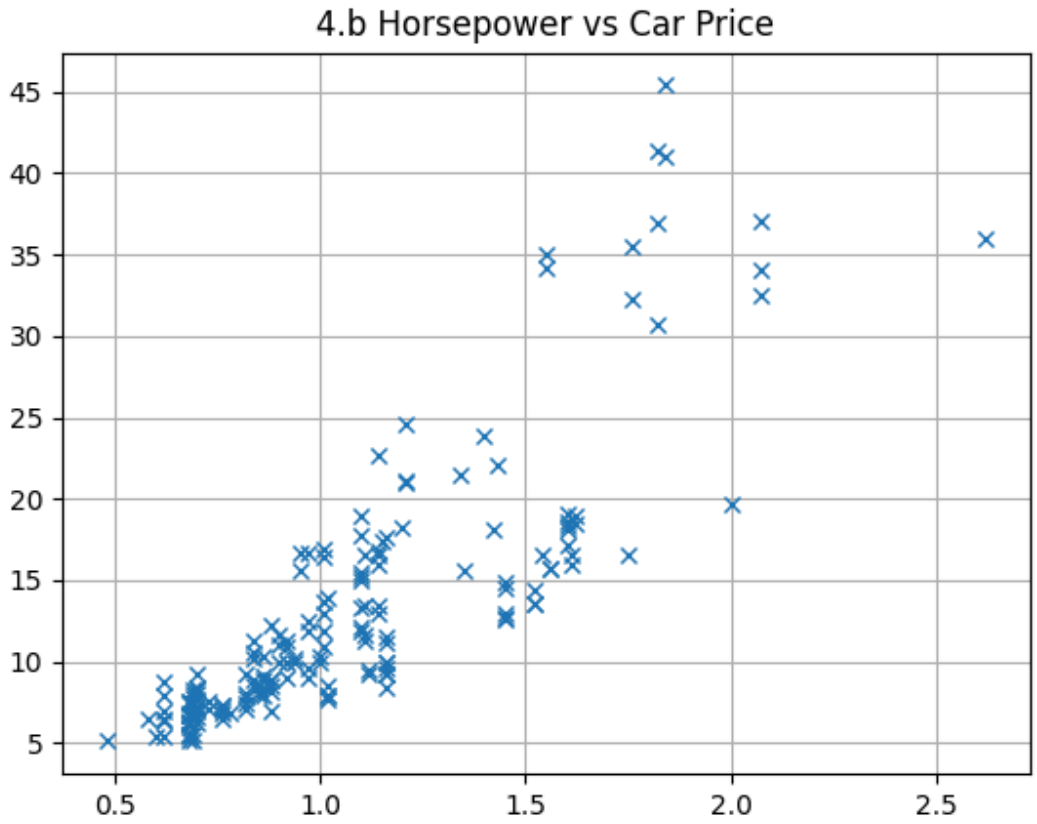
```
Theta =  [0.77052025 0.5738491  0.38296213]
Cost =  0.356
```

3)

```
Theta = [[2.13162821e-14] [7.50000000e-01] [7.50000000e-01]]
yes there is a significant difference, since we only did 15 iterations on the
original problem with a small alpha we were going to take a long time to
converge on the right answer, however normal equation generates it right away
```

4)

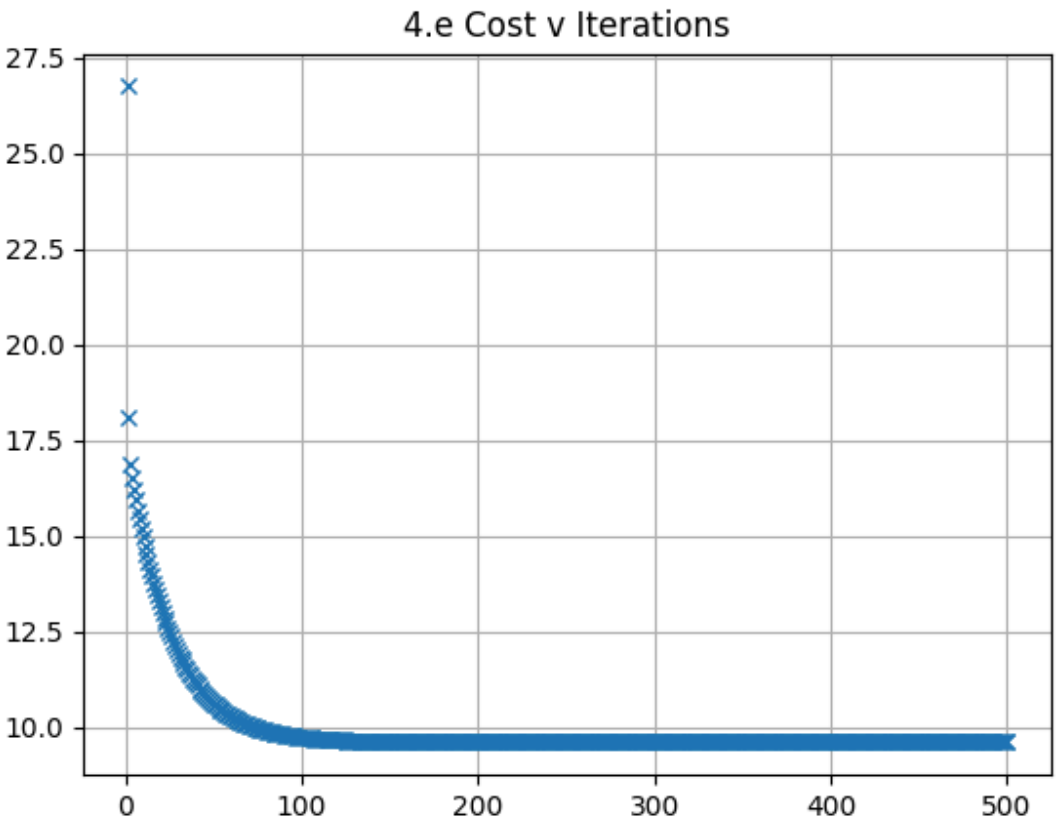
b) ps2-4-b.png



c)

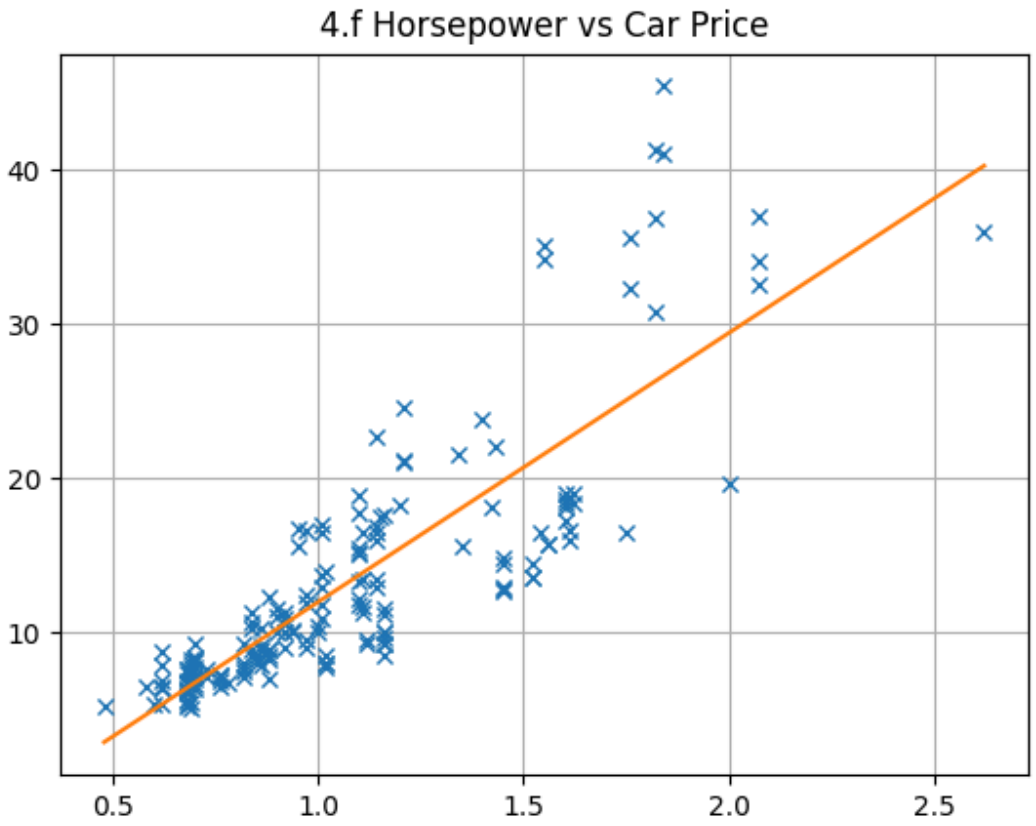
```
X Shape = (178,2)
Y Shape = (178,1)
```

e) ps2-4-e.png




```
theta =  [-5.90699204 17.89402502]
```

f) **ps2-4-f.png**



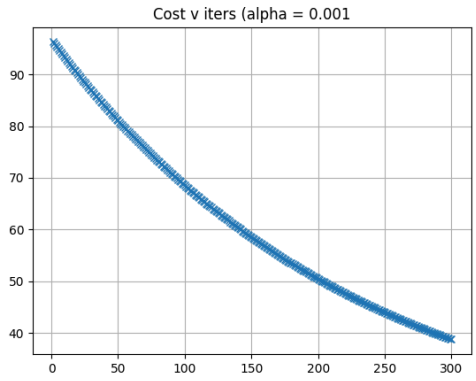
g)

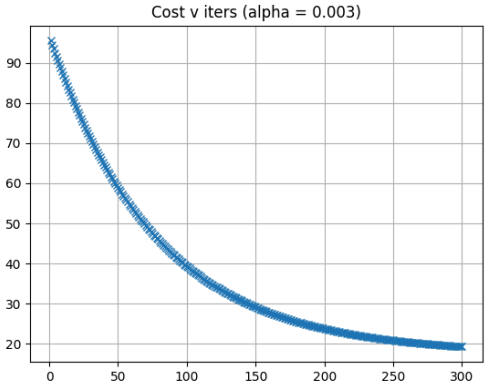
```
Square error =  9.204338759996107
```

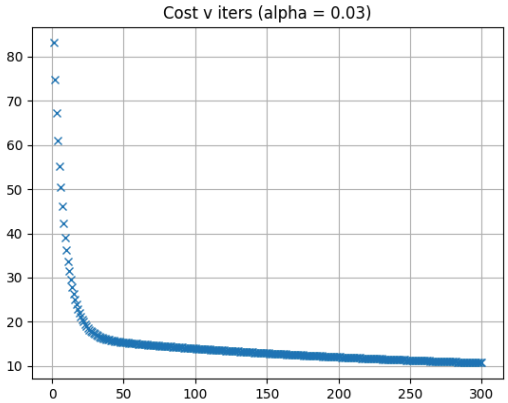
h)

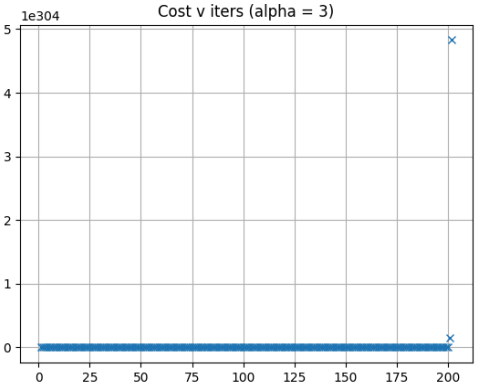
```
Square error =  9.204338759996107
It is to be noted they are very similar, because we know that
there are significant enough iterations in the linear regression
that they will be similar if not the same. We can use this to
confirm that we have converged on a right answer
```

i) ps2-4-i(1-4).png









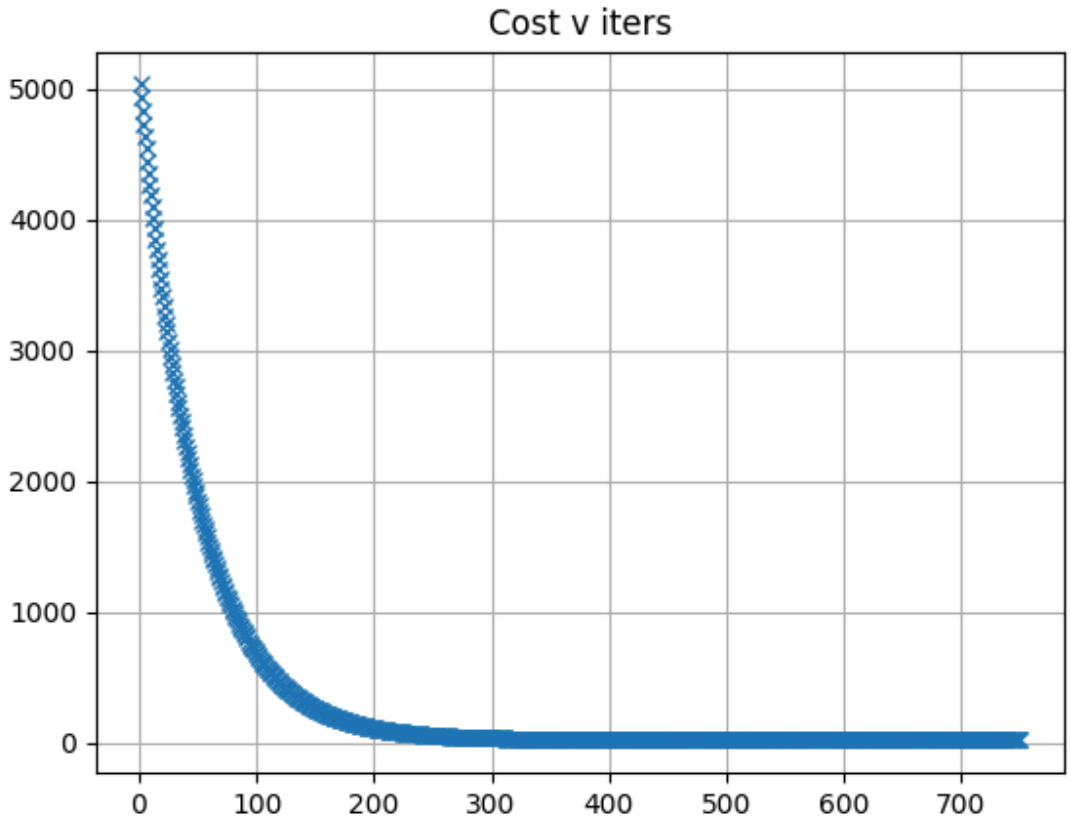
We can see different cases where alpha is underfit (1), the right fit(2), a little overfit(3) and too large(3), this causes the ability of the function to converge very difficult.

5)

a)

```
X1 mean = 1611.111111111
X2 mean =  1292.2777777777778
X1 std =  383.53456875762674
X2 std =  238.73737443185826
```

b) ps2-5-b.png




```
y = 100.77733699 + 7.32209703*x1 -1.55097003*x2
```

c)

```
y = 114.07632599793462
```