Hands-on 3 =

(1) $\sum_{i=1}^{n} \sum_{j=1}^{n} 1 = \sum_{i=1}^{n} n = n \cdot n = n^2$

Thus: runtime = $O(n^2)$

(2) Excel file provided in the description -

(3) $O(n^2)$, $\Omega(n^2)$, and $\Theta(n^2)$ -

(4) Excel file provided in the description-

Modified Function :-

```
x = f(n)
    x = 1;
    y = 1;
    for i = 1:n
        for j = 1:n
            x = x+1;
            Y = i+j;
```

(4) Will this increase how long it takes the algorithm to run?

Yes, it might slightly increase the execution time since there is an additional operation "y = i+j" being performed in the inner loop-

However, the overall time complexity of $O(n^2)$ has not changed-

(5) Will it affect your results from #1?

No, it would not affect the time complexity-

(6) Merge Sort Implementation =

GitHub repo link provided in the description -