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HANDS ON 3

1 Runtime given by:

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

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

2 (Plot 1_Q2.jpg in repo)

3 Since n^2 denotes for large n, therefore there exists +ve constants c_1 and c_2 for all $n \geq n_0$

$$c_1 n^2 \leq T(n) \leq c_2 n^2$$

$O(n^2)$ upper bound
$\Omega\, n^2$ lower "
$\Theta\, n^2$ tight "

4 For $n < 50$, timings deviate a lot from quadratic curve. For $n \geq 50$ data aligns well with quad polynomical indicates n^2 dominates and overhead is negligible. (Plot 2_Q4.jpg)

4 In modified function, inner loop performs 2 constant time operations. This increases constant factor of runtime.

5 Does not affect asymptotic analysis from part #1 Though actual runtime increases by a constant factor, asymptotic behavior remains same.