**Loop 2 vs Loop 3:**

|  |  |  |  |
| --- | --- | --- | --- |
| n | loop2 (s) | loop3 (s) | loop2/loop3 (s) |
| 64 | 0,042 |  |  |
| 128 | 0,17 | 0,089 | 1,91011236 |
| 256 | 0,69 | 0,364 | 1,895604396 |
| 512 | 2,71 | 1,364 | 1,986803519 |
| 1024 | 10,945 | 5,709 | 1,917148362 |
| 2048 | 43,767 | 23,132 | 1,892054297 |
| 4096 |  | 89,044 |  |

According to the graph we can interpret that Loop2/Loop3 tends to a constant, 1.9. That is because regarding both algorithms have n^2 complexity, loop3 is faster since it does not iterate always to n at its second loop.

Theoretically:

N1 = 128 t1 = 0.17

N2 = 2048 t2 = ?

N2 ^c / N1 ^c \* t1 => N2 ^2 / N1 ^2 \* t1 => 2048^2/ 128^2 \* 0.17 = **43,52 = t2**

N1 = 128 t1 = 0.17

N2 = ? t2 = 43,767

N2^c = t2/t1 \* N1^c => N2 = Sqrt c(t2/t1) \* N1 => N2 = Sqrt 2(43.767/0.17)\*128 = **2053.8 = N2**

**Loop 1 vs Loop 3:**

|  |  |  |  |
| --- | --- | --- | --- |
| n | loop1 (s) | loop2 (s) | loop1/loop2 (s) |
| 32 | 0,046 | 0,109 | 0,422018349 |
| 64 | 0,079 | 0,438 | 0,180365297 |
| 128 | 0,156 | 1,689 | 0,092362345 |
| 256 | 0,406 | 6,987 | 0,058107915 |
| 512 | 0,906 | 27,41 | 0,03305363 |
| 1024 | 2,046 | 108,621 | 0,018836137 |

According to the values seen, we can assure that Loop1/Loop2 tends to 0.

**Loop 4 vs Loop 5:**