1:

$T(N) = T(N - 1) + N * constant$

$= T(N - 2) + (N - 1) * constant + N * constant = T(N - 2) + 2 * N * constant - constant$

$= T(N - 3) + 3 * N * constant - 2 * constant - constant$

If we keep going:

$= T(N - k) + k * N * constant - (k - 1) * constant - \ldots - 2*constant - constant$

$= T(N - k) + k * N * constant - constant * (k*(k - 1))/2$

If we say $k = N$

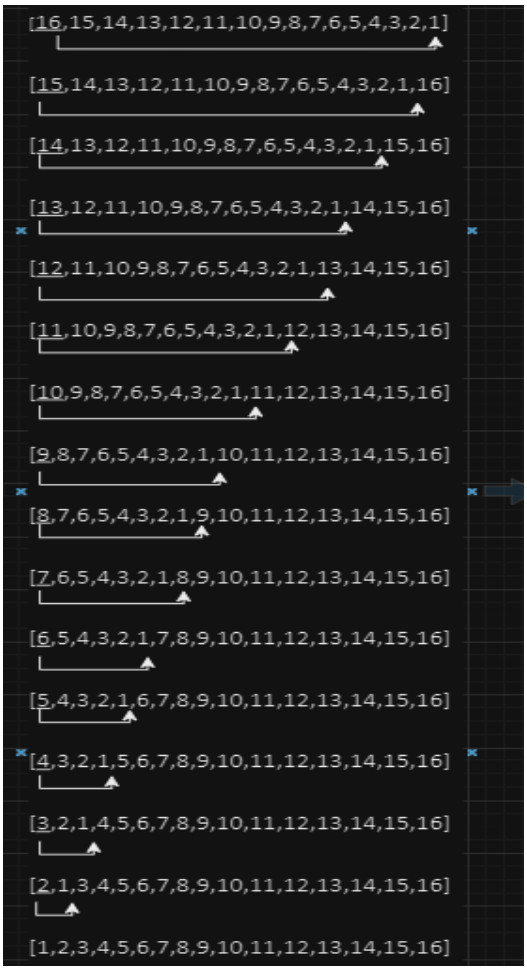
$T(N) = T(0) + N * N * constant - constant * (N * (N-1)/2)$

$= N^2 - N*(N-1)/2$

$= N^2/2 + N/2$

Therefore, the worst-case complexity is $O(N^2)$

2:



4:

Yes, the quadratic interpolation function was very similar and in some runs the same to the actual plotted data.