Problem 2 : Bubble Sort

$$J(N) = 1 + 1 + 2N + (N-1) + x + 1 + x + 3x$$
$$+ 2x + 2x + 1$$
$$= 11x + 3N + 3$$
$$= \frac{11}{2} N^2 - \frac{11}{2} N + 3N + 3 \qquad \text{let}$$
$$x = \frac{(n-1)(n\cdots)}{2}$$

$$\downarrow O(N^2)$$

Selection sort

$$(N-1) + 1 + N - 1 = 2N$$
$$(N-1) + (x+1) + x$$
$$T(N) = 1 + 1 + 2N + N - 1 + N - 1 + x + 1 + x + 3x + x$$
$$+ 2(N-1) + 2(N-1) + 2(N-1) + 1$$
$$= 6x + 10N - 4$$
$$= 3N^2 - 3N + 10N - 4$$
$$T(N) = 3N^2 + 7N - 4$$
$$\rightarrow O(N^2)$$

$$x = \sum_{k=0}^{N-1} N$$
$$= \frac{k(k+1)}{2}$$
$$x = \frac{(N-1)(N)}{2}$$