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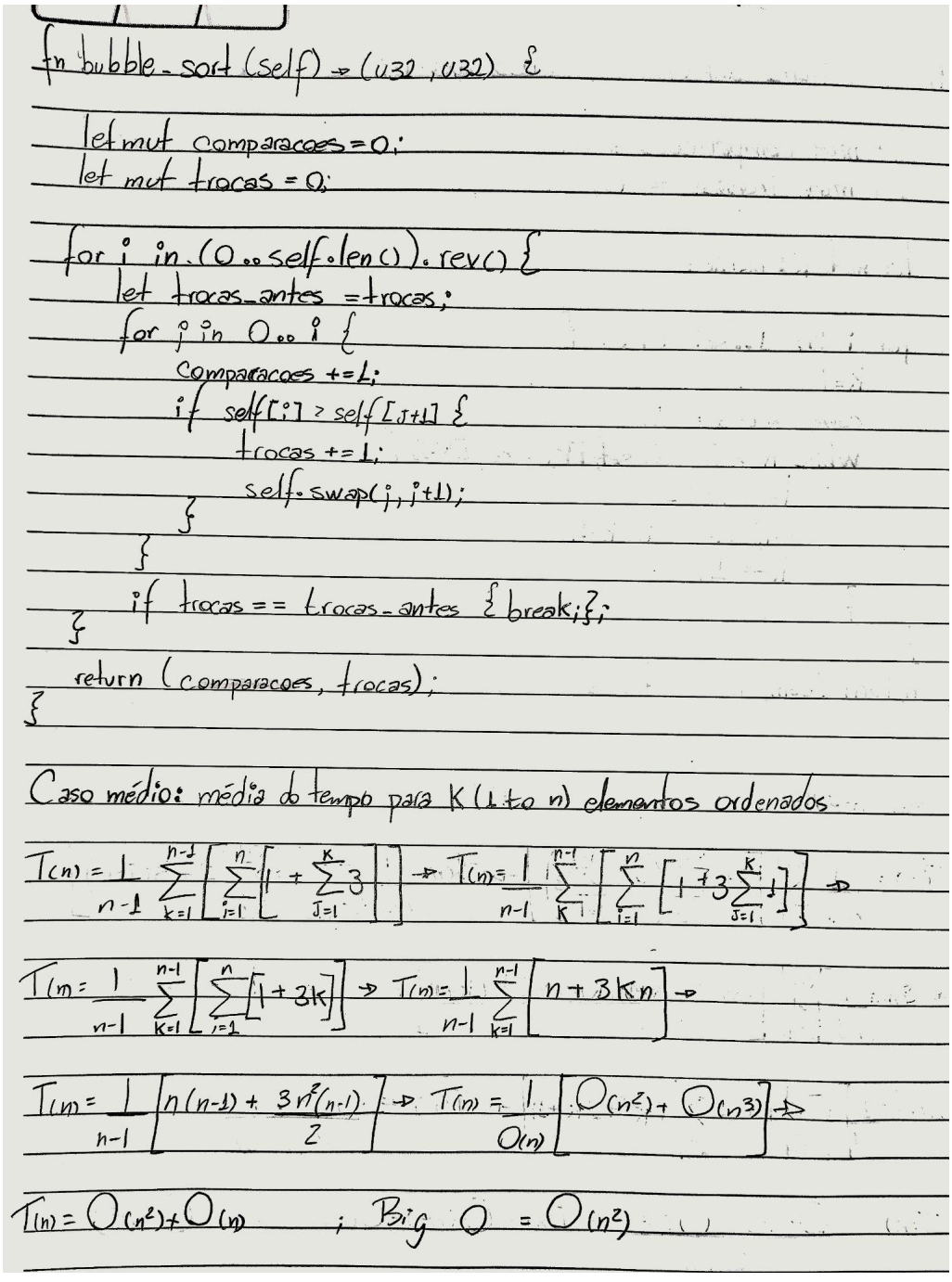
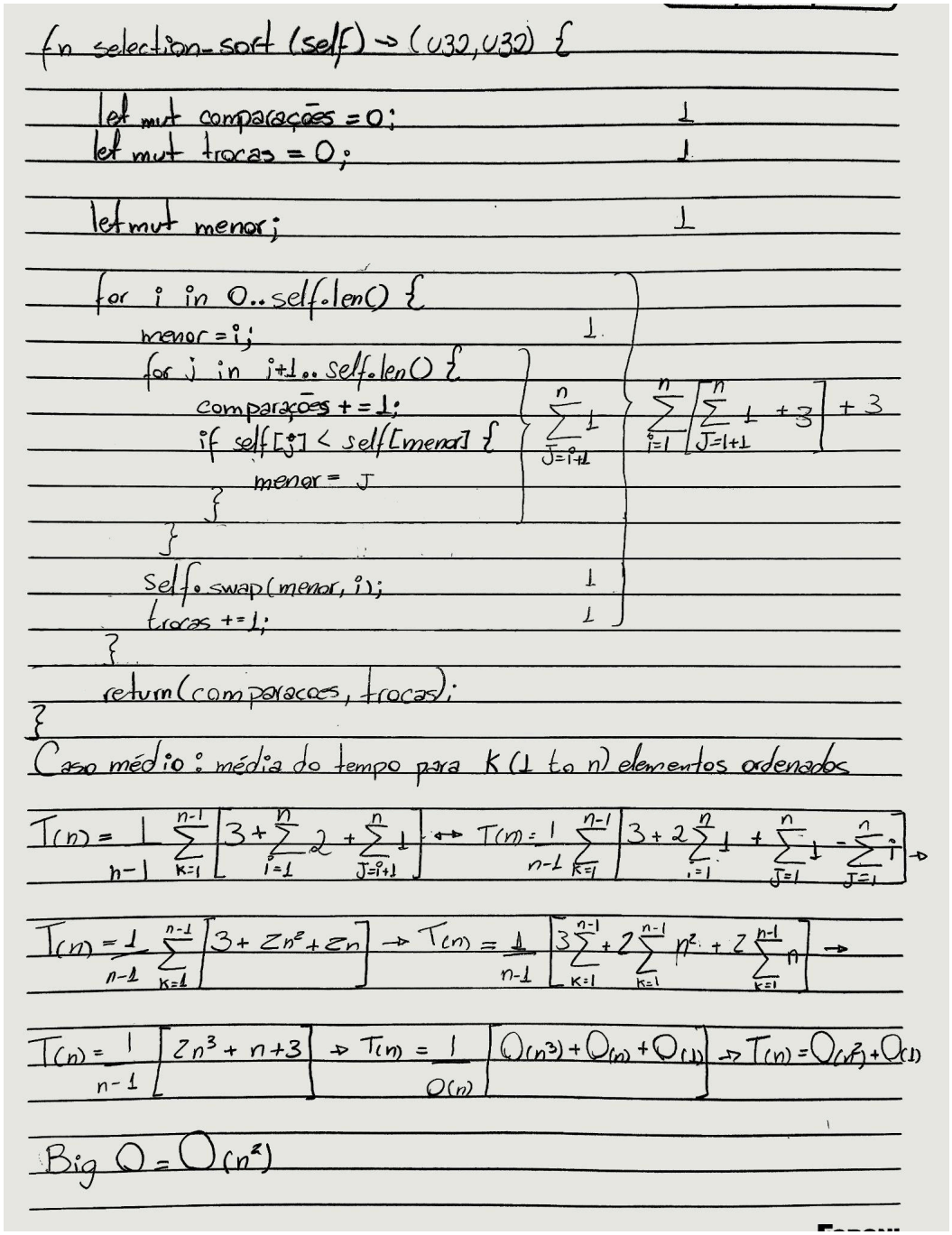
Atividade de AED 2

Observação: Não consegui enviar pelo GDB, pois precisava de uma biblioteca para gerar os números aleatórios, então estou enviando os códigos pelo rust playground, espero que não haja problemas.

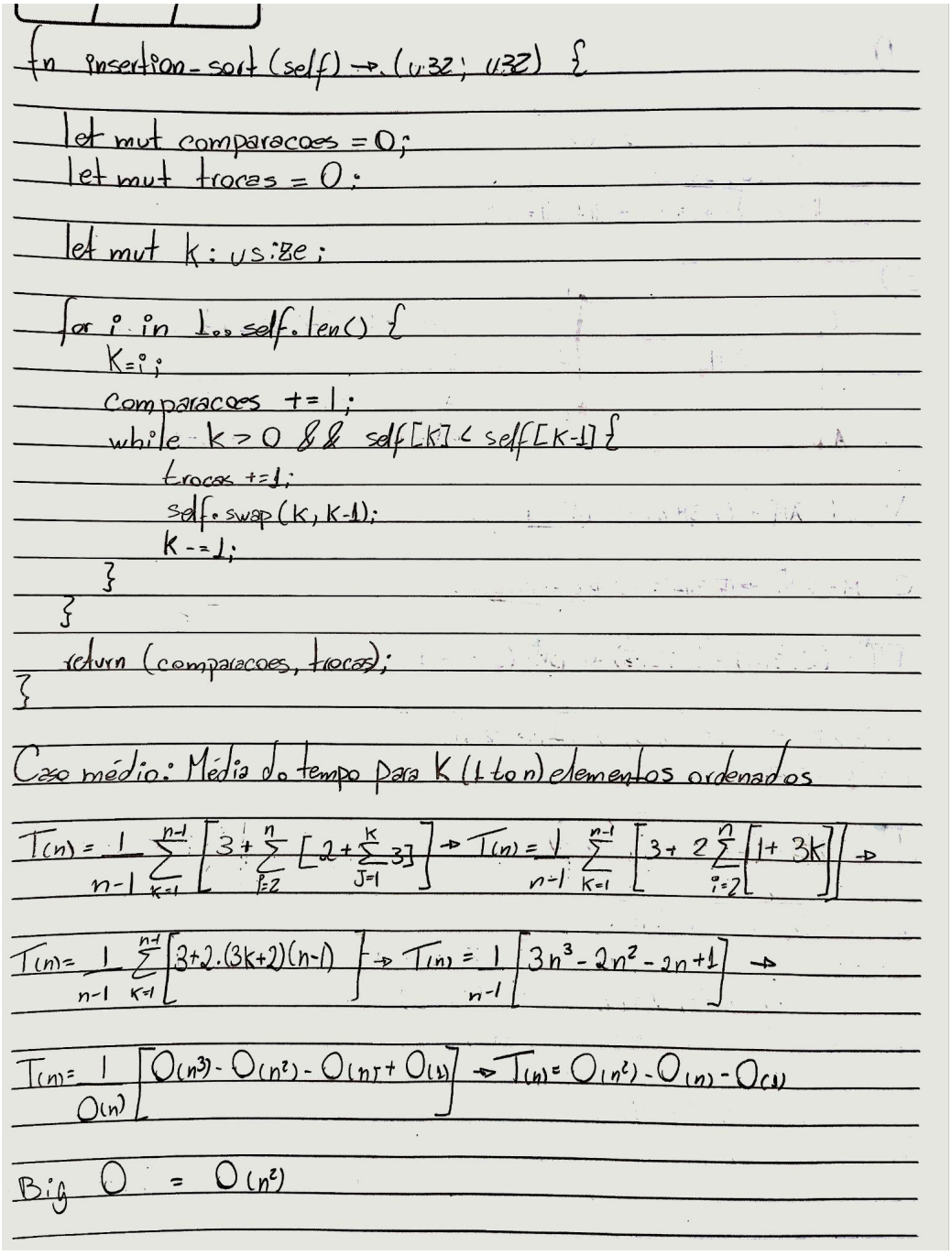
1. O garçom desastrado e a bandeja de copos
   A. Link para o rust playground
      Tempo gasto: 23 484 milissegundos
   B. Cálculo do caso médio:



2. O leiloeiro econômico
   A. [Link para o rust playground]
   Tempo gasto: 19 033 milissegundos
   B. Cálculo do caso médio:



3. O bibliotecário organizado
   A. [Link para o rust playground]
   Tempo gasto: 18 236 milissegundos
   B. Cálculo do caso médio:



```
fn insertion_sort(self) -> (u32, u32) {

    let mut comparacoes = 0;
    let mut trocas = 0;

    let mut k: usize;

    for i in 1.. self.len() {
        K=i;
        comparacoes += 1;
        while k > 0 && self[K] < self[K-1] {
            trocas += 1;
            self.swap(K, K-1);
            K -= 1;
        }
    }
    return (comparacoes, trocas);
}
```

Caso médio: Média do tempo para K (1 to n) elementos ordenados

$$T(n) = \frac{1}{n-1} \sum_{K=1}^{n-1} \left[3 + \sum_{i=2}^{n} \left[2 + \sum_{J=1}^{K} 3 \right] \right] \rightarrow T(n) = \frac{1}{n-1} \sum_{K=1}^{n-1} \left[3 + 2 \sum_{i=2}^{n} \left[1 + 3K \right] \right] \rightarrow$$

$$T(n) = \frac{1}{n-1} \sum_{K=1}^{n-1} \left[3 + 2 \cdot (3K+2)(n-1) \right] \rightarrow T(n) = \frac{1}{n-1} \left[3n^3 - 2n^2 - 2n + 1 \right] \rightarrow$$

$$T(n) = \frac{1}{O(n)} \left[O(n^3) - O(n^2) - O(n) + O(1) \right] \rightarrow T(n) = O(n^2) - O(n) - O(1)$$

Big O = $O(n^2)$

4. Ordenação manual
   A. Com selection sort:

[42,17,89,5,73,31,64,96,23,58,10,37,81,12,50] → [5,17,89,42,73,31,64,96,23,58,10,37,81,12,50]

[5,17,89,42,73,31,64,96,23,58,10,37,81,12,50] → [5,10,89,42,73,31,64,96,23,58,17,37,81,12,50]

[5,10,89,42,73,31,64,96,23,58,17,37,81,12,50] → [5,10,12,42,73,31,64,96,23,58,17,37,81,89,50]

[5,10,12,42,73,31,64,96,23,58,17,37,81,89,50] → [5,10,12,17,73,31,64,96,23,58,42,37,81,89,50]

[5,10,12,17,73,31,64,96,23,58,42,37,81,89,50] → [5,10,12,17,23,31,64,96,73,58,42,37,81,89,50]

[5,10,12,17,23,31,64,96,73,58,42,37,81,89,50] → [5,10,12,17,23,31,64,96,73,58,42,37,81,89,50]

[5,10,12,17,23,31,64,96,73,58,42,37,81,89,50] → [5,10,12,17,23,31,37,96,73,58,42,64,81,89,50]

[5,10,12,17,23,31,37,96,73,58,42,64,81,89,50] → [5,10,12,17,23,31,37,42,73,58,96,64,81,89,50]

[5,10,12,17,23,31,37,42,73,58,96,64,81,89,50] → [5,10,12,17,23,31,37,42,50,58,96,64,81,89,73]

[5,10,12,17,23,31,37,42,50,58,96,64,81,89,73] → [5,10,12,17,23,31,37,42,50,58,96,64,81,89,73]

[5,10,12,17,23,31,37,42,50,58,96,64,81,89,73] → [5,10,12,17,23,31,37,42,50,58,64,96,81,89,73]

[5,10,12,17,23,31,37,42,50,58,64,96,81,89,73] → [5,10,12,17,23,31,37,42,50,58,64,73,81,89,96]

[5,10,12,17,23,31,37,42,50,58,64,73,81,89,96] → [5,10,12,17,23,31,37,42,50,58,64,73,81,89,96]

[5,10,12,17,23,31,37,42,50,58,64,73,81,89,96] → [5,10,12,17,23,31,37,42,50,58,64,73,81,89,96]

B. Com Insertion sort:

[42,17,89,5,73,31,64,96,23,58,10,37,81,12,50] → [17,42,89,5,73,31,64,96,23,58,10,37,81,12,50]

[17,42,89,5,73,31,64,96,23,58,10,37,81,12,50] → [17,42,89,5,73,31,64,96,23,58,10,37,81,12,50]

[17,42,89,5,73,31,64,96,23,58,10,37,81,12,50] → [5,17,42,89,73,31,64,96,23,58,10,37,81,12,50]

[5,17,42,89,73,31,64,96,23,58,10,37,81,12,50] → [5,17,42,73,89,31,64,96,23,58,10,37,81,12,50]

[5,17,42,73,89,31,64,96,23,58,10,37,81,12,50] → [5,17,31,42,73,89,64,96,23,58,10,37,81,12,50]

[5,17,31,42,73,89,64,96,23,58,10,37,81,12,50] → [5,17,31,42,64,73,89,96,23,58,10,37,81,12,50]

[5,17,31,42,64,73,89,96,23,58,10,37,81,12,50] → [5,17,31,42,64,73,89,96,23,58,10,37,81,12,50]

[5,17,31,42,64,73,89,96,23,58,10,37,81,12,50] → [5,17,23,31,42,64,73,89,96,58,10,37,81,12,50]

[5,17,23,31,42,64,73,89,96,58,10,37,81,12,50] → [5,17,23,31,42,58,64,73,89,96,10,37,81,12,50]

[5,17,23,31,42,58,64,73,89,96,10,37,81,12,50] → [5,10,17,23,31,42,58,64,73,89,96,37,81,12,50]

[5,10,17,23,31,42,58,64,73,89,96,37,81,12,50] → [5,10,17,23,31,37,42,58,64,73,89,96,81,12,50]

[5,10,17,23,31,37,42,58,64,73,89,96,81,12,50] → [5,10,17,23,31,37,42,58,64,73,81,89,96,12,50]

[5,10,17,23,31,37,42,58,64,73,81,89,96,12,50] → [5,10,12,17,23,31,37,42,58,64,73,81,89,96,50]

[5,10,12,17,23,31,37,42,58,64,73,81,89,96,50] → [5,10,12,17,23,31,37,42,50,58,64,73,81,89,96]