Problem 1. Consider an array of size nine with the numbers $50, 30, 90, 10, 20, 70, 40, 80, 60$. Assume you execute quicksort using the version of partition from CLRS (and from class).

(a) What is the array after the first partition. How many comparisons did you use? How many exchanges? Do not count the move in the instruction X $\leftarrow$ A[r]. Note that in this algorithm an element might exchange with itself, which counts as one exchange.

(b) How many comparisons and exchanges do you use when you quicksort the entire left side of the pivot.

(c) How many comparisons and exchanges do you use when you quicksort the entire right side of the pivot.

Problem 2. Assume you execute quicksort using the version of partition from CLRS (and from class).

(a) What is the fewest exchanges that the algorithm will execute for an input of size n. No justification needed.

(b) Give an example with $n = 8$.

Problem 3. For this problem you may use a calculator for a few calculations.

Consider $\sum_{k=1}^{100} k^{3/2}$.

(a) Use a non-integral method to show that the sum is between 15,000 and 70,000.

(b) Approximate the sum using integrals. Make sure to get an upper and lower bound.