General Instructions:

- The submission due date of this assignment is **Tuesday(19th April 2022) midnight** (before **12:00 am**)
- Write a report (i.e. in a word file) that illustrates your main solution steps including the best fitness values and the average values, plotted over generations (with and without elitism).
- Zip your code and the report in a file entitled [**YourName_YourID_AssignmentNumber**] and upload on Blackboard.
- This assignment should be delivered and discussed INDIVIDUALLY.

Requirements:

In light of Assignment #2, solve the following optimization problem:

$$\text{Maximize } F(x_1, x_2) = 8 - (x_1 + 0.0317)^2 + (x_2)^2, \text{ where } -2 \le x_1, x_2 \le 2$$

1. Initialize the population using real encoding, where R_max and R_min are two real numbers
   pop = init_pop(pop_size, R_max, R_min)

2. Apply arithmetic crossover operator as follows
   two_children = arithmetic_cross(two_parents, Pcross = 0.6)

3. Build a function to apply Gaussian mutation with a fixed standard deviation, your function may look like..
   new_individual = gaussian_mutate(individual, sigma = 0.5, pMut = 0.05, R_max , R_min)

4. In the previous two assignments, the selection process was done using Roulette wheel selection, in this assignment you are asked to apply (**Tournament Selection**) with two different k values (very small and very large). Compare the results of both.
   Selected_Individuals = tournament(pop, k)

5. All other implementation settings in the previous assignment should remain the same (i.e. population size, number of generations, elitism with elite size = 2)

6. Do you have any improvements over Assignment#2's results? Which of the above operators is the most effective one (Selection, Crossover, or Mutation) in improving the results?