Q6

Understand the schemata theorem of GA (relevance of selection/crossover/mutation with the 3 components of the schema theorem. Apply the theorem to the optimization function f(x)= x3-2x2+x. Check whether the empirical results obtained earlier in assignment-I matches with the theorem.

Introduction:

Using the established methods and genetic operators of genetic algorithms, the schema theorem states that short, low-order schemata with above-average fitness increase exponentially in successive generations. Expressed as an equation:

Here {\displaystyle m(H,t)}is the number of strings belonging to schema {\displaystyle H}H at generation {\displaystyle t}t, {\displaystyle f(H)} is the *observed* average fitness of schema {\displaystyle H}H and {\displaystyle a\_{t}} is the *observed* average fitness at generation {\displaystyle t}t. The probability of disruption {\displaystyle p}p is the probability that crossover or mutation will destroy the schema {\displaystyle H}H. It can be expressed as:

{\displaystyle p={\delta (H) \over l-1}p\_{c}+o(H)p\_{m}}where {\displaystyle o(H)} is the order of the schema, {\displaystyle l}l is the length of the code, {\displaystyle p\_{m}} is the probability of mutation and {\displaystyle p\_{c}} is the probability of crossover. So, a schema with a shorter defining length {\displaystyle \delta (H)} is less likely to be disrupted.