Maximize $f(x) = \dfrac{x^2}{2} - 3x$ **, when x in [1 to 31]**

Binary Encoding – 5 digits

Initialization of Population

1. Selection
2. Crossover/Recombination
3. Mutation
4. Survival/Accept

Update Population

1. Selection (Let us take 6 chromosomes in initial population)

String No	Initial Population	x	$f(x) = \dfrac{x^2}{2} - 3x$	Probability	Bin
1	[1,0,0,1,0]	18	108	0.211	0.001-0.211
2	[1,0,0,1,1]	19	123.5	0.242	0.212-0.453
3	[1,0,1,1,1]	23	195.5	0.383	0.454-0.836
4	[0,1,1,1,0]	14	56	0.110	0.837-0.946
5	[0,0,1,0,1]	5	0 [if negative]	0	---
6	[0,1,0,1,1]	11	27.5	0.054	0.947-1.00
Total			**510.5**	**1.00**	

Let us select 4 parents and perform 2. crossover and 3. mutation

Random Number	Selected Bin	Chosen Parent	Offspring after Crossover at random point	Offspring after Mutation (1% chance)
0.54	0.454-0.836	[1,0,1,1,1]	[1,0,1,1,0]	[1,**1**,1,1,0]
0.88	0.837-0.946	[0,1,1,1,0]	[0,1,1,1,1]	[0,1,1,1,1]
0.45	0.212-0.453	[1,0,0,1,1]	[1,0,0,1,0]	[1,0,0,1,0]
0.20	0.001-0.211	[1,0,0,1,0]	[1,0,0,1,1]	[1,0,0,1,1]

4. Accept/Survival

Offspring	x	Fitness, f(x)
[1,1,1,1,0]	30	360
[0,1,1,1,1]	15	67.5
[1,0,0,1,0]	18	108
[1,0,0,1,1]	19	123.5

[Select survivors and add to population]

String No	Initial Population
1	[1,0,0,1,0]
2	[1,0,0,1,1]
3	[1,0,1,1,1]
4	[0,1,1,1,0]
5	[0,0,1,0,1]
6	[0,1,0,1,1]
7	[1,1,1,1,0]

Check termination [Condition]

New Cycle: