task1

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Question 1: Genetic algorithm

1.

Function

$$f(x) = \frac{x^2}{e^x} - 2exp(-(9sinx)/(x^2 + x + 1))$$

```
f <- function(x){
  part1 <- (x^2) / exp(x)
  expPart <- -(9*sin(x)) / ((x^2) + x + 1)
  return(part1 -2 * exp(expPart))
}
```

2.

Crosover function $\frac{x+y}{2}$:

```
crossover <- function(x,y){
  return((x+y)/2)
}
```

3.

mutate function $x^2 mod 30$:

```
mutate <- function(x){
  return((x^2)%% 30)
}
```

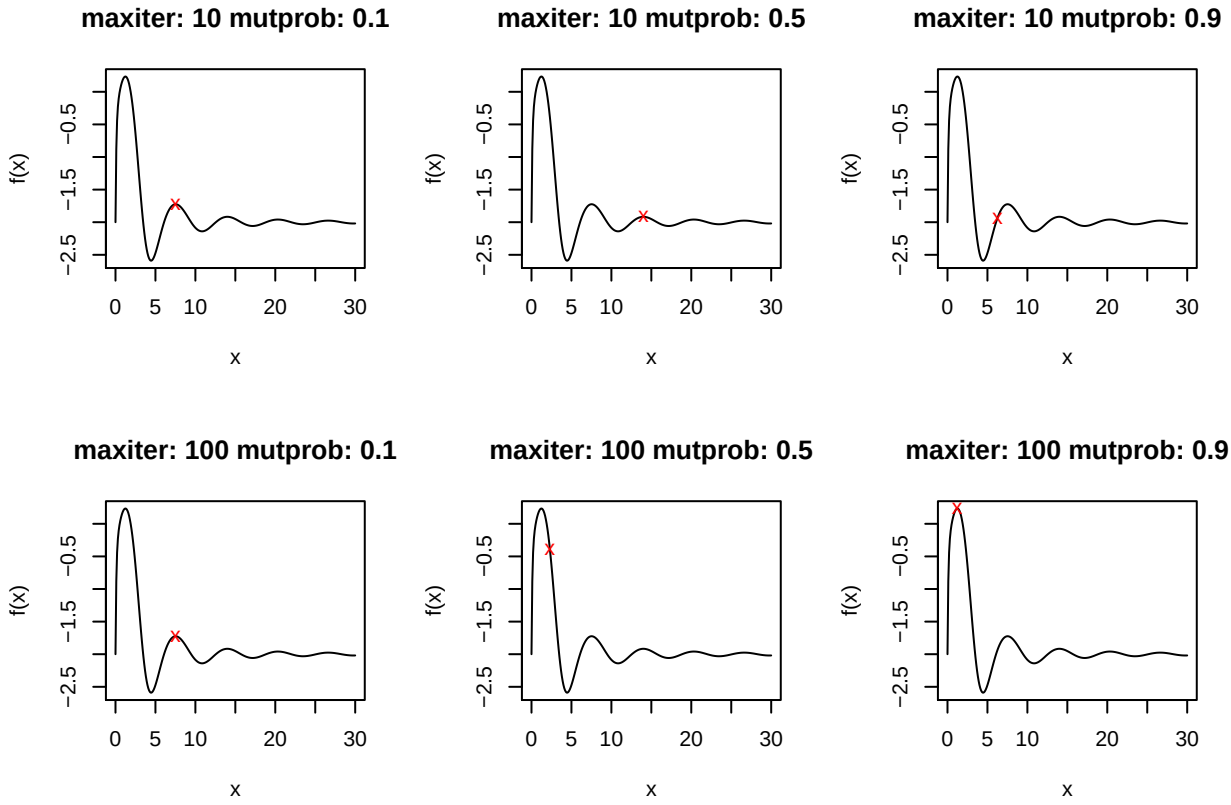
4.

Function implementing genetic algorithm:

1. initialazise parameters
2. select parents
3. select victim

4. generate kid by crosover and mutation
5. replace victim with kid
6. save best value
7. repeat steps 2 to 3 maxiterations times.

5.



initial	0.000000	5.000000	10.000000	15.000000	20.000000	25.000000	30.000000
10 0.1	11.562500	27.500000	7.500000	15.000000	20.000000	15.625000	7.812500
10 0.5	19.066410	6.250000	27.500000	15.000000	20.000000	19.066410	14.003906
10 0.9	6.250000	15.000000	6.250000	15.000000	22.890625	6.250000	6.250000
100 0.1	13.998413	7.500000	13.998225	9.124556	13.998209	13.998276	13.998241
100 0.5	2.324874	2.316414	2.324874	2.307954	2.316414	2.307954	2.307954
100 0.9	1.692196	2.082080	1.691462	1.300844	1.300844	6.897851	1.219281

10 iterations are not enough for genetic algorithm to find the max value. It can be seen that increasing mutation propability, max value will fluctuate around the max value and will not reach it.