

## Lecture 19 -- Activity

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### Evolutionary and Genetic Algorithms

**Activity 1a.** Optimize the function  $f(x) = (\cos(x) + x^3) * \sin(x)$ , defined over the interval  $[0, 20]$ . Report the optimal value of decision variables and objective function.

$$x^* = 17.4492$$

$$f(x^*) = -5236.023$$

**Activity 1b.** Optimize the function  $f(x_1, x_2) = 20 + x_1^2 + x_2^2 - 10(\cos(2\pi x_1) + \cos(2\pi x_2))$ , defined over the interval  $[-5.12, 5.12], [-5.12, 5.12]$ . Report the optimal value of decision variables and objective function.

$$x_1^* = -1.15633 \times 10^{-5}$$

$$x_2^* = -2.980232 \times 10^{-5}$$

$$f(x_1^*, x_2^*) = 2.027346 \times 10^{-7}$$

**Activity 1c.** Optimize the function  $f(x_1, x_2) = 100(x_1^2 - x_2)^2 + (1 - x_1)^2$ , defined over the interval  $[0, 1], [0, 13]$ . Account for the following constraints:

$$x_1 x_2 + x_1 - x_2 + 1.5 \leq 0$$

$$10 - x_1 x_2 \leq 0$$

Report the optimal value of decision variables and objective function.

$$x_1^* = 0.8121198$$

$$x_2^* = 12.31369$$

$$f(x_1^*, x_2^*) = 13605.28$$