

# Results

This section presents the experimental results from the gradient descent optimization study, including convergence analysis and performance comparisons.

## Convergence Analysis

### Convergence Trajectories

Figure 1 illustrates the convergence behavior of gradient descent for different step sizes, starting from the initial point  $x_0 = 0$ . The algorithm iteratively updates the solution using the rule

$$x_{k+1} = x_k - \alpha \nabla f(x_k).$$

