Case Study

The objective of this case study is to illustrate the performance of the gradient descent algorithm to minimize a given function.

The gradient descent algorithm has the form,

$$x^{(k+1)} = x^{(k)} - \alpha \nabla f\left(x^{(k)}\right).$$

For the function

$$f = f(x_1, x_2) = 4(x_1 - 2)^2 + (x_2 - 3)^2,$$

we obtain the sequence of the first four points using the method of the gradient descent for the step size $\alpha = 0.2$ and locate these points on the level sets of f. The initial guess is $x^{(0)} = 0$. The resulting points are shown in the figure below.