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$$f(x) = (x-6)^2, \quad x \in [-1; 10], \quad \varepsilon = 0.1, \quad x_0 = 0$$

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Монте-Карло

① $x = -1$
 $f(x) = 49$
 $f(x) < f(x_{\min})$? нет \Rightarrow

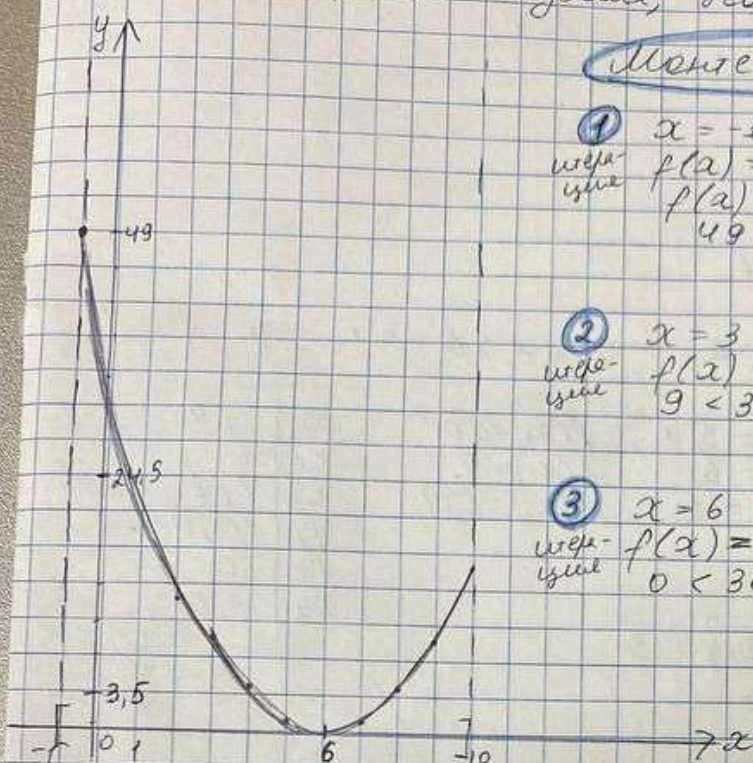
$$\begin{aligned} x_{\min} &= 0 \\ f(x_{\min}) &= 36 \\ x_{\min} &= 0 \\ f_{\min} &= 36 \end{aligned}$$

② $x = 3$
 $f(x) = 9$
 $9 < 36$? да \Rightarrow

$$\begin{aligned} x_{\min} &= 3 \\ f_{\min} &= 9 \end{aligned}$$

③ $x = 6$
 $f(x) = 0$
 $0 < 36$? да \Rightarrow

$$\begin{aligned} x_{\min} &= 6 \\ f_{\min} &= 0 \end{aligned}$$



Лауэрия

① $x_1 = 0, \quad \Delta x = 0.1$

② $x_2 = 0.1$

③ $f(x_1) = 36, \quad f(x_2) = 34.81$

④ $f(x_1) > f(x_2)$? да $\Rightarrow x_3 = x_1 + 2\Delta x = 0.2$

$x_3 < x_1$? нет
 $0.2 < 0$

x_1	0
x_2	0.1
x_3	0.2
f_1	36
f_2	34.81
f_3	33.64

⑤ $f(x_3) = 33.64$
 $f_{\min} = \min\{36, 34.81, 33.64\} = 33.64$

$x_{\min} = x_3 = 0.2$

⑥ $a_1 = \frac{f(x_2) - f(x_1)}{x_2 - x_1} = \frac{34.81 - 36}{0.1 - 0} = -11.9$

$a_2 = \frac{1}{x_3 - x_2} \left(\frac{f(x_3) - f(x_1)}{x_3 - x_1} - \frac{f(x_2) - f(x_1)}{x_2 - x_1} \right) = \frac{1}{0.2 - 0.1} \left(\frac{33.64 - 36}{0.2} - \frac{34.81 - 36}{0.1} \right) = 1$

$\bar{x} = \frac{x_2 + x_1}{2} - \frac{a_1}{2a_2} = \frac{0.1 + 0}{2} - \frac{-11.9}{2 \cdot 1} = 6$

Проверка

$$x \in (x_1, x_2)?$$

$6 \in (0, 0,2)?$ нет \Rightarrow новая итерация
 $x_1 = 6$

2 итерация

$$x_1 = 6, \delta = 0,1$$

$$(1) \quad x_2 = 6,1$$

$$(2) \quad f(x_1) = 0, \quad f(x_2) = 0,01$$

$$(3) \quad f(x_1) > f(x_2)? \quad \text{нет} \Rightarrow x_3 = x_1 - \delta x = 6 - 0,1 = 5,9$$

$$x_3 < x_1?$$

$$5,9 < 6$$

$$\text{га} \Rightarrow \begin{aligned} x_1 &= x_3 = 5,9; & f(x_1) &= 0,01 \\ x_2 &= x_1 = 6; & f(x_2) &= 0 \\ x_3 &= x_2 = 6,1; & f(x_3) &= 0,01 \end{aligned}$$

x_1	5,9
x_2	6
x_3	6,1
f_1	0,01
f_2	0
f_3	0,01

$$(4) \quad f(x_3) = f(6,1) = 0,01$$

$$F_{\min} = \min\{0,01; 0; 0,01\} = 0$$

$$x_{\min} = x_2 = 6$$

$$(5) \quad a_1 = \frac{0 - 0,01}{0,1} = -0,1$$

$$a_2 = \frac{1}{6,1 - 6} \left(\frac{0,01 - 0,01}{6,1 - 5,9} - \frac{0,1 - 0,01}{6 - 5,9} \right) = 10 \cdot 0,1 = 1$$

$$\bar{x} = \frac{11,9}{2} - \frac{(0,1)}{2} = 6$$

Проверка, $6 \in (5,9; 6,1)?$
га

$$(6) \quad a) \quad |F_{\min} - f(\bar{x})| \leq \varepsilon?$$

$$|0 - 0| \leq \varepsilon? \text{ га}$$

\Rightarrow поиск закончен \Rightarrow

$$|x_{\min} - \bar{x}| \leq \delta?$$

$$|6 - 6| \leq \delta? \text{ га}$$

$$\Rightarrow \boxed{\begin{aligned} x_{\min} &= 6 \\ f_{\min} &= 0 \end{aligned}}$$

Ньютона

1 итерация

$$(1) \quad x_0 = 0, \quad \varepsilon = 0,1$$

$$(2) \quad x_{n+1} = x_n - \frac{f'(x_n)}{f''(x_n)} \quad \text{---}$$

$$\text{---} \quad x_1 = x_0 - \frac{f'(x_0)}{f''(x_0)} = 0 - \frac{(-12)}{2} = 6$$

$$\begin{aligned} f'(x) &= 2(x-6) \\ f''(x) &= 2 \end{aligned}$$

$$(3) \quad f'(x_1) = 0; \quad |f'(x_1)| \leq \varepsilon? \text{ га} \Rightarrow$$

$$\boxed{\begin{aligned} x_{\min} &= 6 \\ f_{\min} &= 0 \end{aligned}}$$