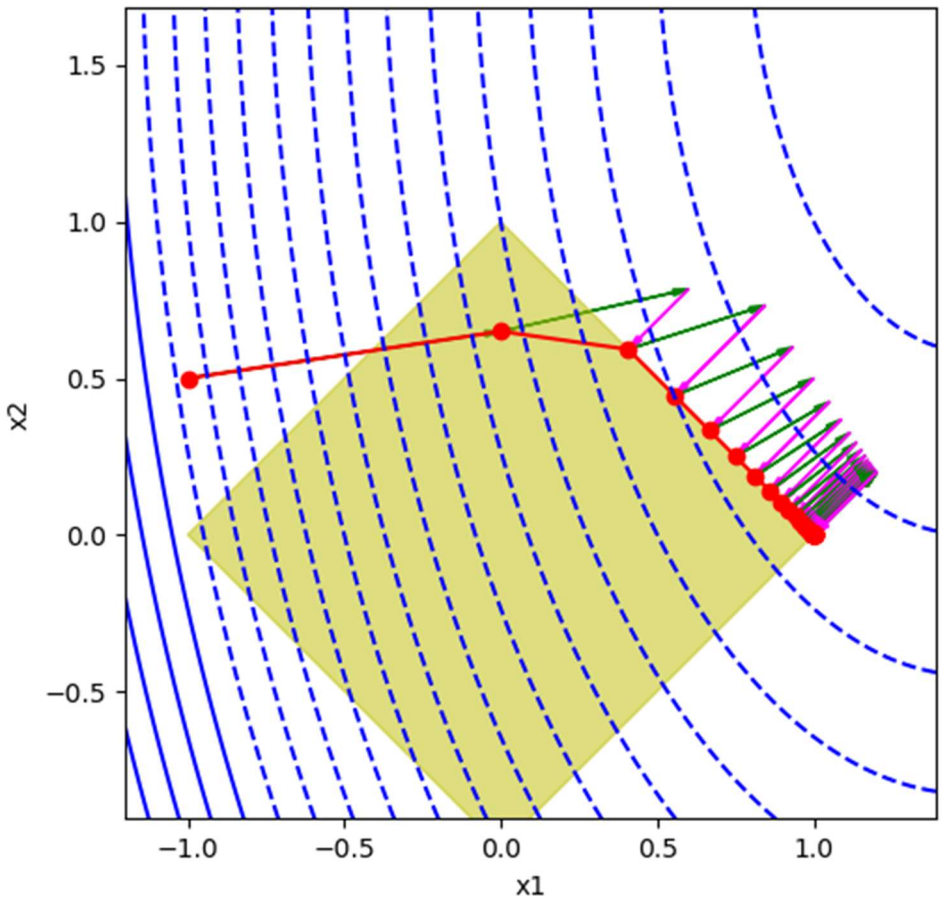
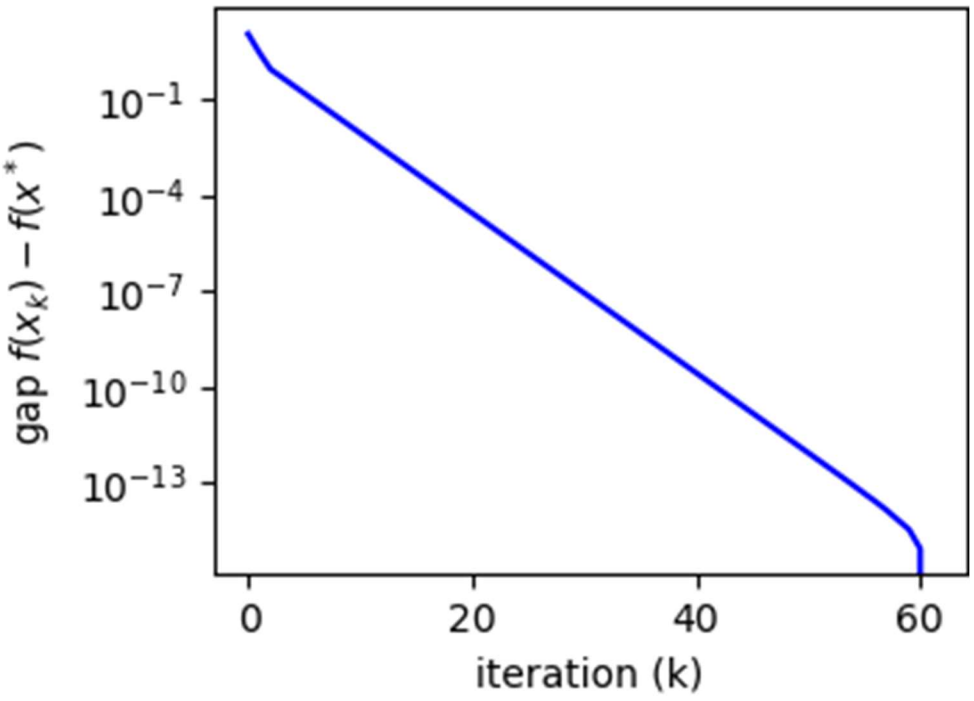
1. I chose stepsize = 0.1.

```
t =  1
number of iterations: 61
solution: [9.99999975e-01 2.51943347e-08]
value: 4.500000000000002
```





2.

(a)

e^{x_1}, e^{2x_2} and e^{2x_3} are convex, so $f(x)$ is convex.

$$L(x,\lambda) = e^{x_1} + e^{2x_2} + e^{2x_3} + \lambda(x_1 + x_2 + x_3 - 1)$$

The Lagrange conditions are

$$\begin{cases} e^{x_1} + \lambda = 0 & ① \\ 2e^{2x_2} + \lambda = 0 & ② \\ 2e^{2x_3} + \lambda = 0 & ③ \\ x_1 + x_2 + x_3 = 1 & ④ \end{cases}$$

①, ②, ③: $e^{x_1} = 2e^{2x_2} = 2e^{2x_3}$

$$\Rightarrow x_1 = 2x_2 + \ln 2 = 2x_3 + \ln 2$$

Plug it into ④: $x_1 = \frac{1+\ln 2}{2}$

Thus,
$$\begin{cases} x_1^* = \frac{1+\ln 2}{2} \\ x_2^* = x_3^* = \frac{1-\ln 2}{4} \\ \lambda^* = -\sqrt{2e} \end{cases}$$

$$f^* = 2\sqrt{2e}$$

(b) I chose stepsize = 0.1.

```
number of iterations: 46
solution: [0.84657357 0.07671322 0.07671322]
value: 4.66328796319425
```