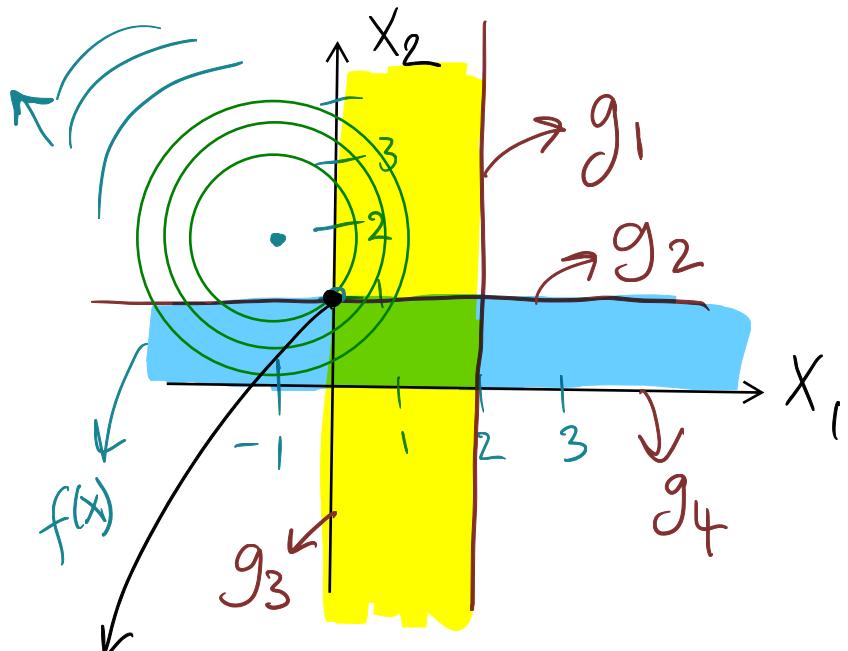


1) $\min_{x_1, x_2} f(x) = (x_1 + 1)^2 + (x_2 - 2)^2$
 s.t. $g_1 = x_1 - 2 \leq 0, \quad g_3 = -x_1 \leq 0$
 $g_2 = x_2 - 1 \leq 0, \quad g_4 = -x_2 \leq 0$



minimum point

Root point: $x = -1, y = 2$

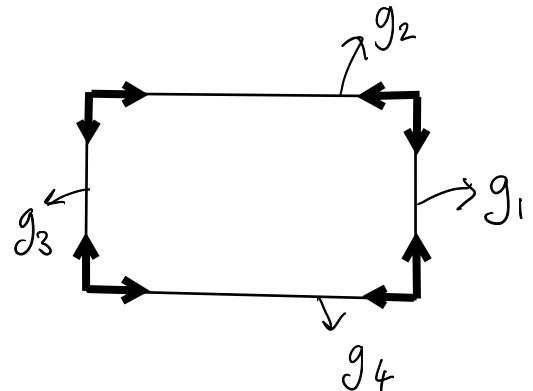
$$g_1 = x_1 - 2 \leq 0 \Rightarrow x_1 \leq 2$$

$$g_2 = x_2 - 1 \leq 0 \Rightarrow x_2 \leq 1$$

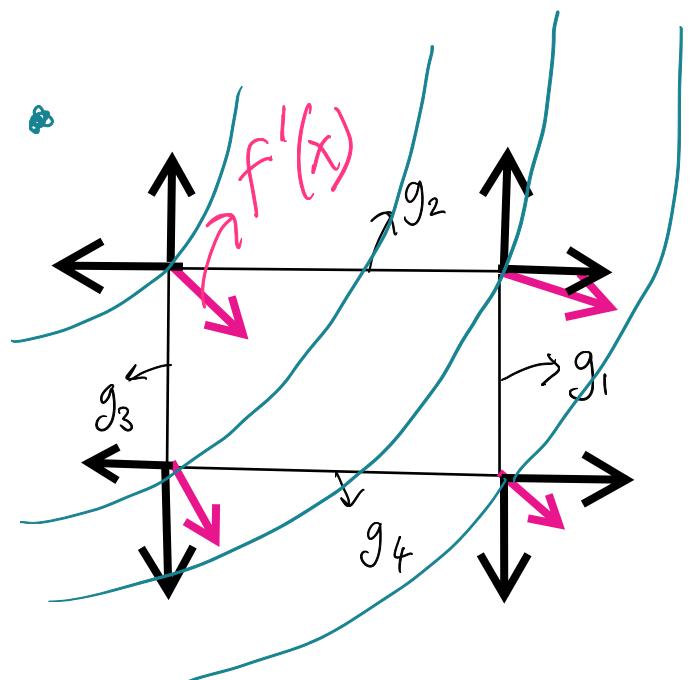
$$g_3 = -x_1 \leq 0 \Rightarrow x_1 \geq 0$$

$$g_4 = -x_2 \leq 0 \Rightarrow x_2 \geq 0$$

Feasible descent:



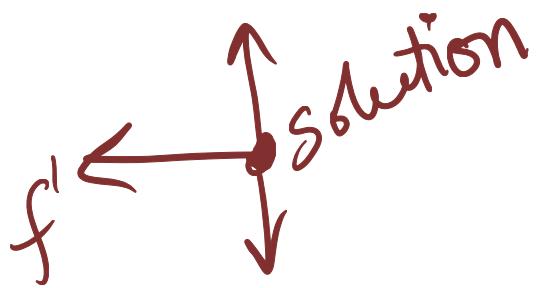
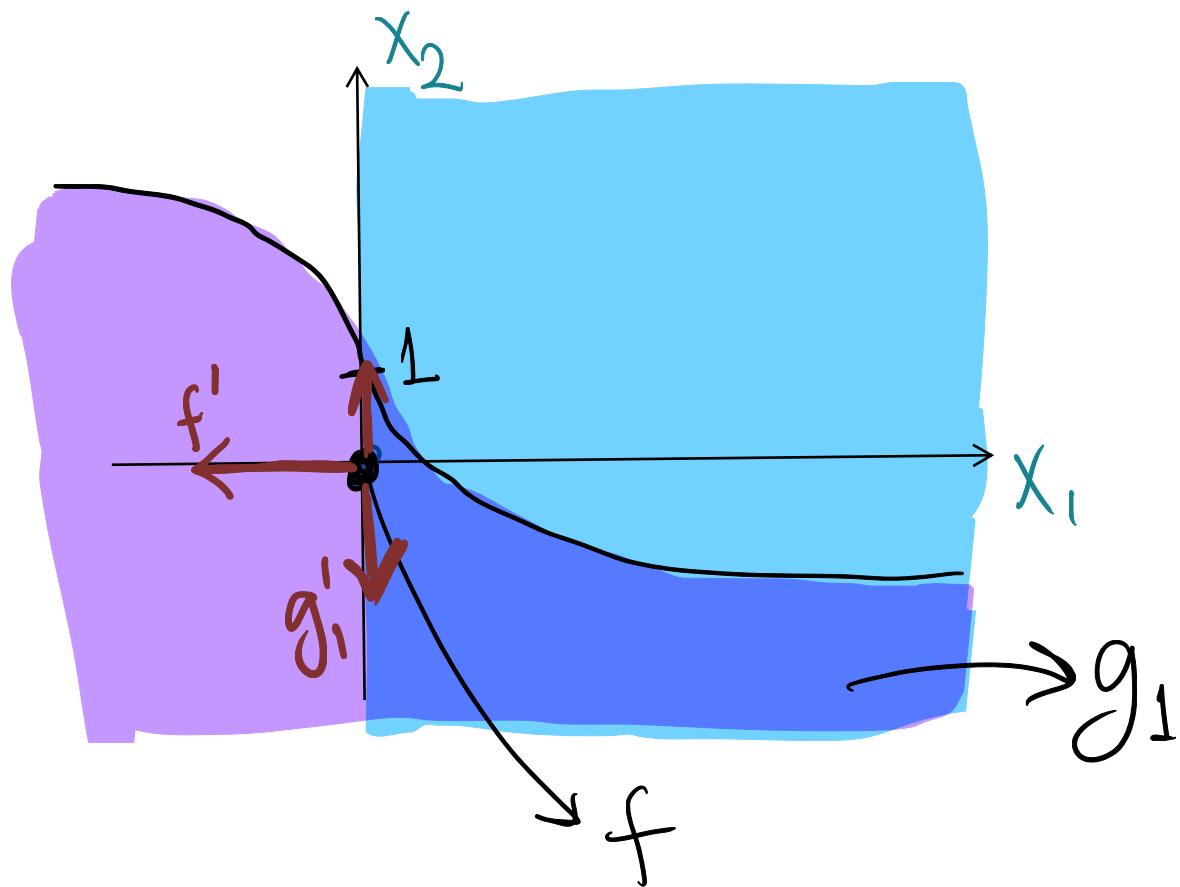
Gradient Directions:



$$2) \min_{x_1, x_2} f = -x_1 + 0x_2$$

$$\text{s.t. } g_1 = x_2 - (1-x_1)^3 \leq 0 \quad \text{and } x_2 \geq 0$$

Root point: $x_1 = 0, x_2 = 0$



KKT does not apply

$$3) \quad \text{s.t.} \quad f = x_1x_2 + x_2x_3 + x_1x_3$$

$$x_1, x_2, x_3$$

$$\text{s.t.} \quad h = x_1 + x_2 + x_3 - 3 = 0$$

