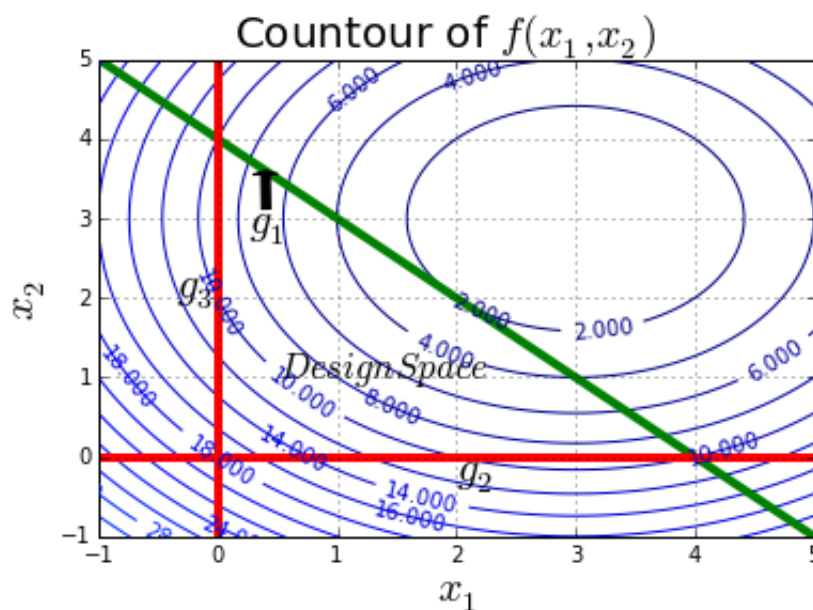


Admir Makas

EGR 7040 Optimization HW#4

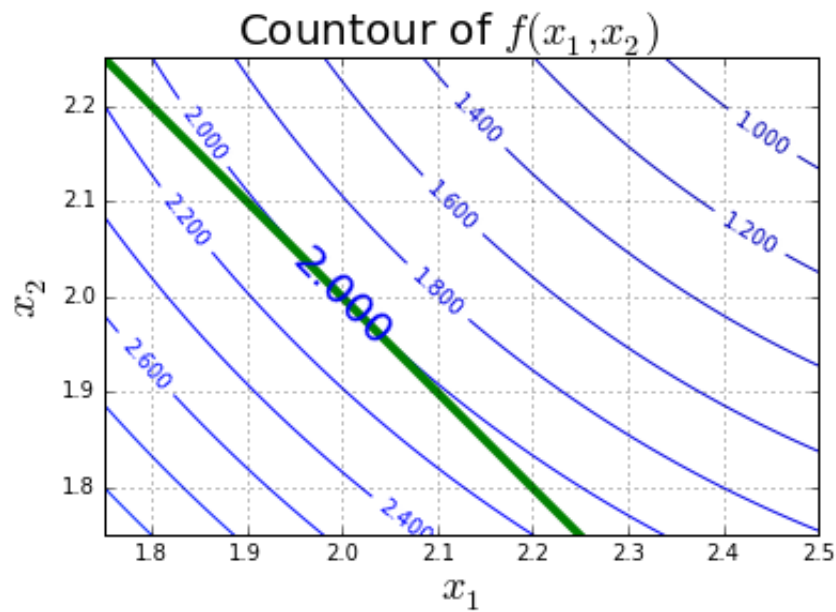
Problem 3.1

$$\begin{aligned} 3.1 \text{ Minimize } f(x_1, x_2) &= (x_1 - 3)^2 + (x_2 - 3)^2 \\ \text{subject to } x_1 + x_2 &\leq 4 \\ x_1, x_2 &\geq 0 \end{aligned}$$



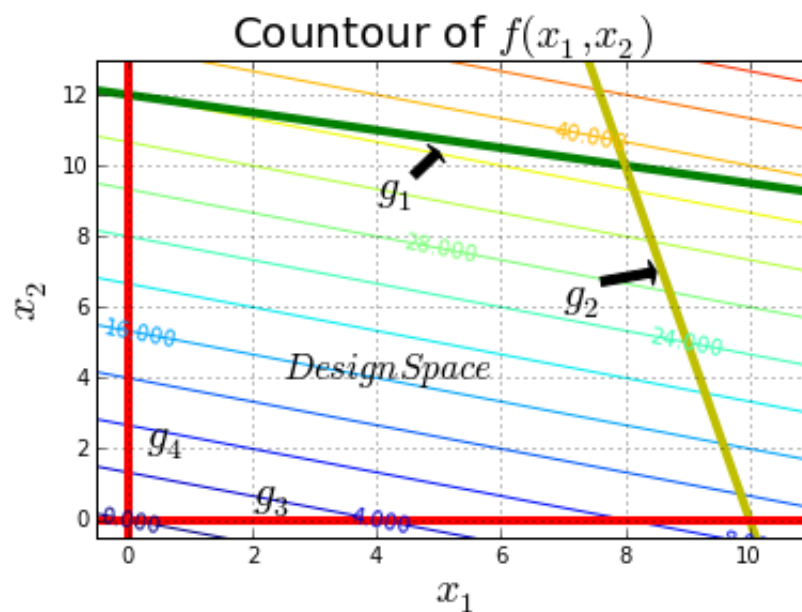
From the above plot it appears that the minimum function value is at 2.0. Figure below zooms in at the minimum point to confirm that 2.0 is in fact the optimum value. The objective function is non-linear in this case but the constraints are linear

Constraint g_1 is active at the optimum point.



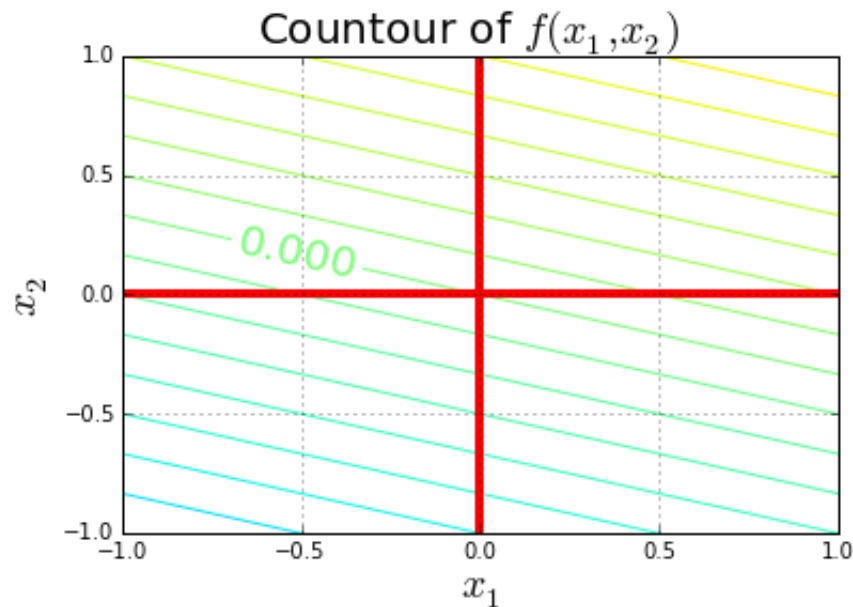
Problem 3.3

3.3 Minimize $f(x_1, x_2) = x_1 + 3x_2$
 subject to $x_1 + 4x_2 \geq 48$
 $5x_1 + x_2 \geq 50$
 $x_1, x_2 \geq 0$



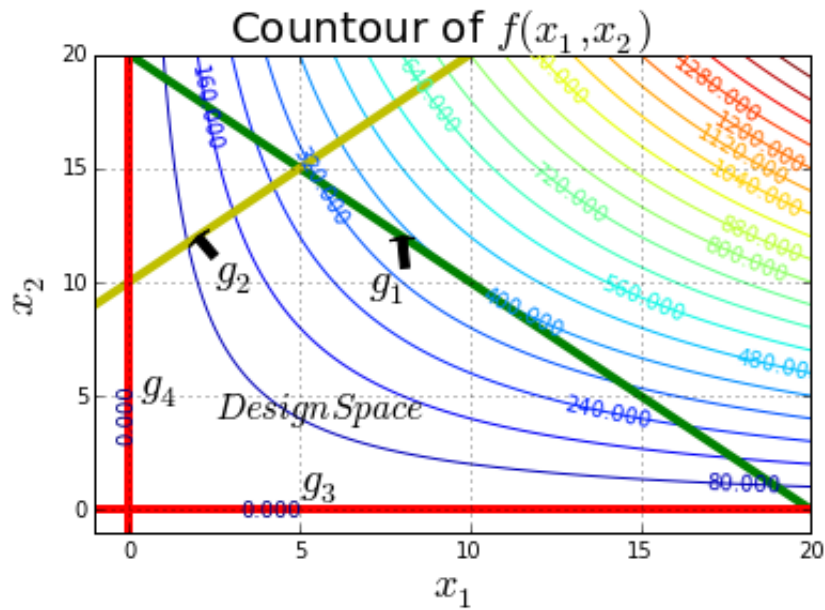
From the above plot it appears that the minimum function value is at approximately 0.0. Figure below zooms in at the maximum point to confirm that 0.0 is in fact the optimum value. Both the constraints and objective function are linear.

Side constraints g_3 and g_4 are active at the optimum point.



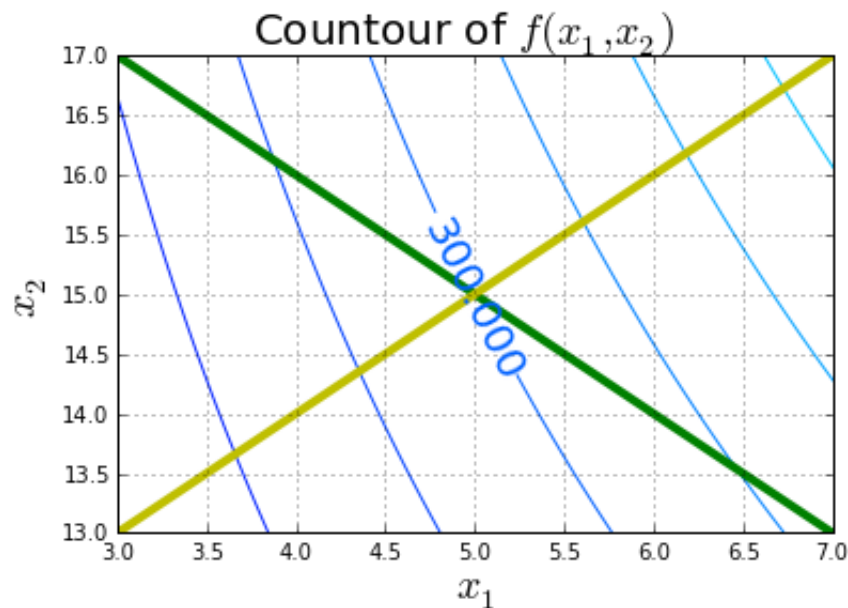
Problem 3.5

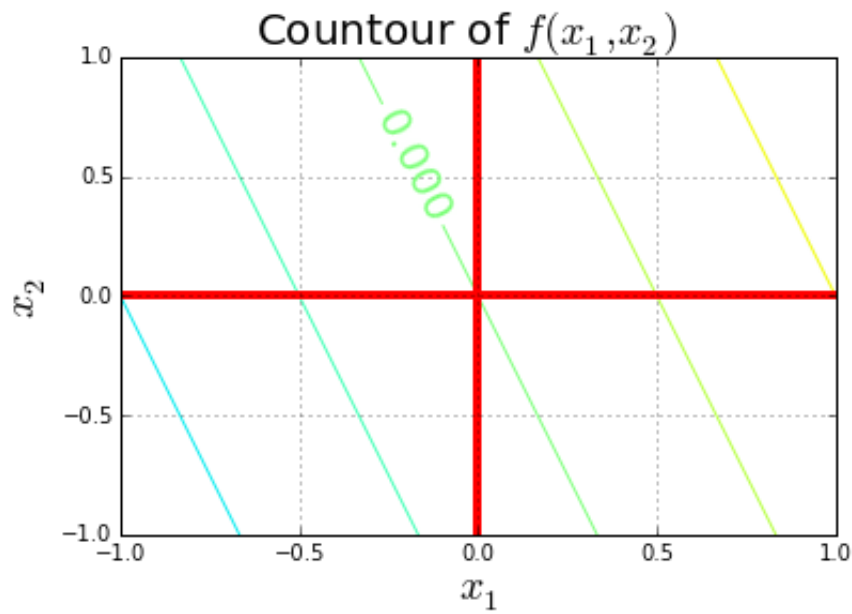
$$\begin{aligned}
 & \mathbf{3.5} \quad \text{Maximize } F(x_1, x_2) = 4x_1x_2 \\
 & \quad \text{subject to } x_1 + x_2 \leq 20 \\
 & \quad \quad \quad x_2 - x_1 \leq 10 \\
 & \quad \quad \quad x_1, x_2 \geq 0
 \end{aligned}$$



From the above plot it appears that the maximum function value is at approximately 300.0. Figure below zooms in at the maximum point to confirm that 300.0 is in fact the optimum value. Constraints are linear while the objective function is nonlinear.

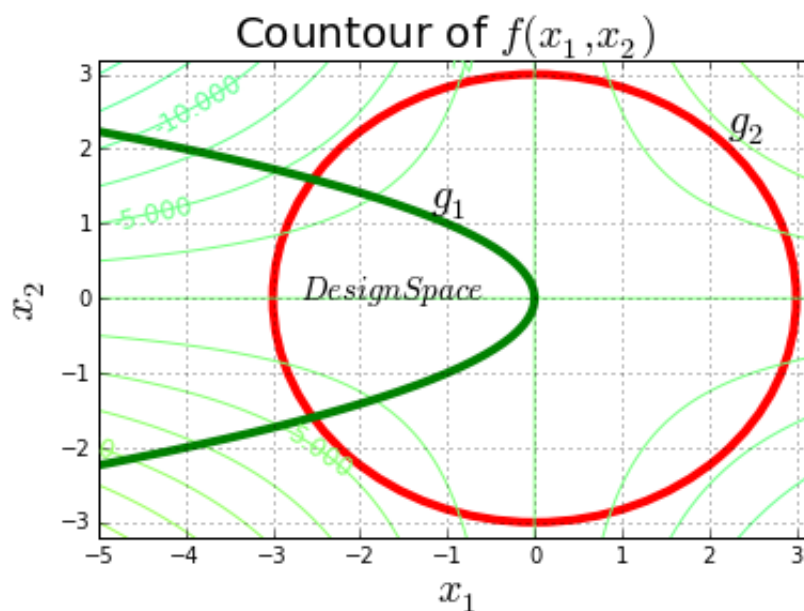
Constraints g_1 and g_2 are active at the optimum point.





Problem 3.9

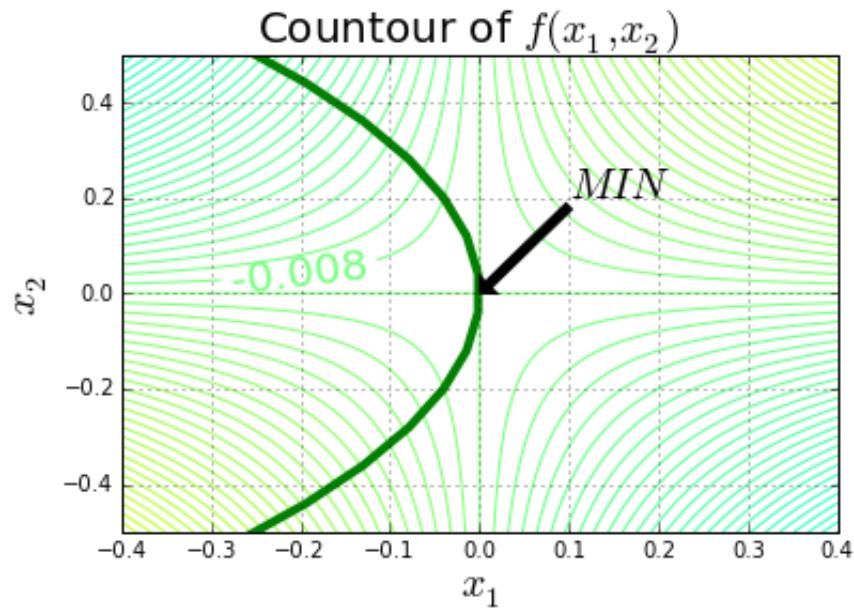
3.9 Minimize $f(x_1, x_2) = x_1 x_2$
 subject to $x_1 + x_2^2 \leq 0$
 $x_1^2 + x_2^2 \leq 9$



From the above plot it appears that the minimum function value is at approximately 0.0. Figure below zooms in at the minimum point to confirm that 0.0 is the optimum value. Constraints and the objective function are nonlinear.

Constraint g_1 is active at the optimum point.

Out[332]: <matplotlib.text.Annotation at 0xb65f6a0>



Out[333]: The raw code for this IPython notebook is by default hidden for easier reading. To toggle on/off the raw code, click [here](#).