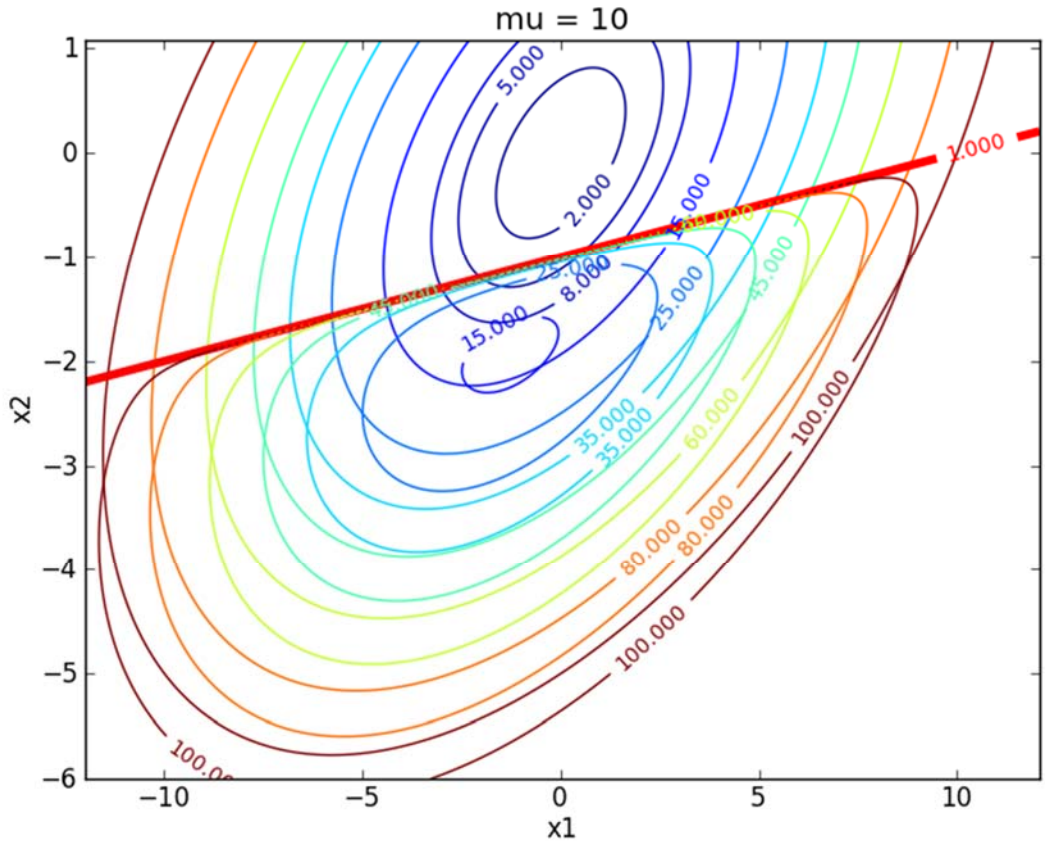
Name:_____

ME575 Homework: Interior Point Method

1. Solve the following problem using the interior point method:

$$\begin{aligned} \min \quad & x_1^2 - 2x_1x_2 + 4x_2^2 \\ \text{s.t.} \quad & 0.1\,x_1 - x_2 > 1 \end{aligned}$$

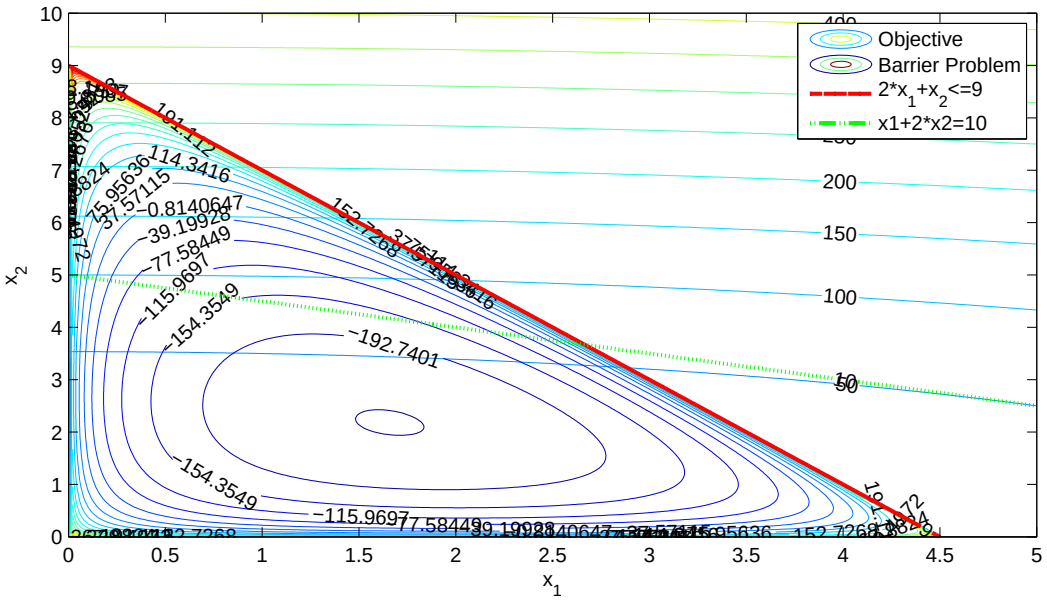
Starting from x_1=-5, x_2=-5, λ=0, solve for one step with a barrier parameter μ = 10 and a step size α = 0.5. Plot the beginning and ending point for the step on the contour map below.



2. For the problem:

$$\begin{aligned} \min \quad & f = x_1^2 + 2x_2^2 \\ \text{s.t.} \quad & 2x_1 + x_2 \leq 9 \\ & x_1 + 2x_2 = 10 \\ & x_1 > 0, x_2 > 0 \end{aligned}$$

and starting at the point, $x_1 = 3, x_2 = 2$ and barrier parameter $\mu = 100$, take one step by solving the barrier problem of the interior point algorithm. Use a step size of α = 0.5 and starting Lagrange multipliers of zero for the equations.



b) Show how the step would change if you were to use a barrier parameter of $\mu = 10$ instead of 100. What are some of the tradeoffs with starting with either a high or low barrier parameter μ?

c) Solve the problem with the IPOPT (Interior Point) solver at the following web address:
http://apmonitor.com/online/view_pass.php?f=ipm.apm
Comment on the number of iterations, how the barrier parameter is reduced, the line search progress, or other items relevant to progress towards convergence.