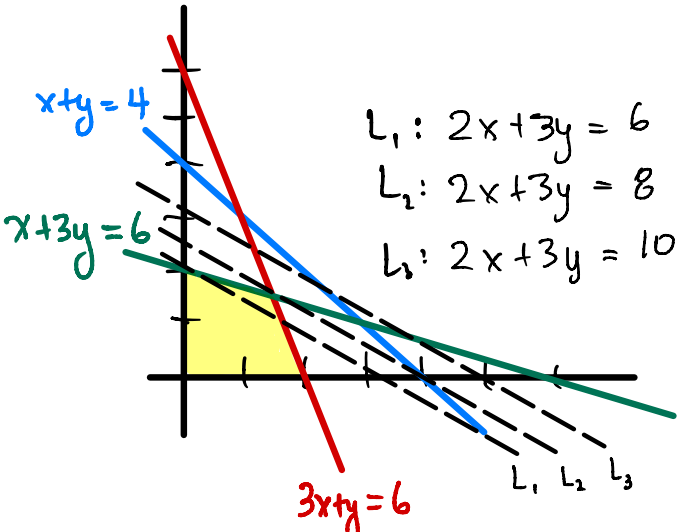
Math 354
Quiz #2 Name: Solutions netID: _____ Section: _____

Consider the linear programming programming problem:
Maximize $z = 2x + 3y$ subject to

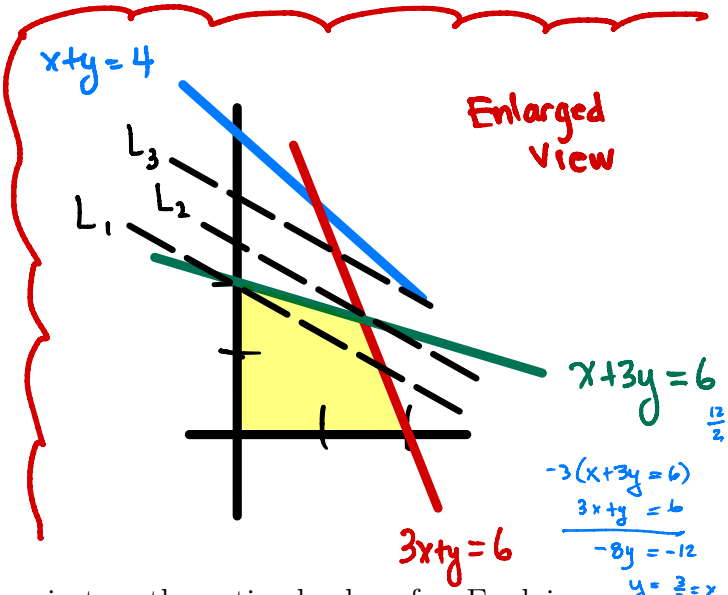
$$\begin{aligned} x + y &\le 4 \\ 3x + y &\le 6 \\ x + 3y &\le 6 \\ x \ge 0,\ & y \ge 0. \end{aligned}$$

1. Sketch the set of feasible solutions to the linear programming problem, and draw the level curves for the objective function $z = \mathbf{c}^\top \mathbf{x} = k$ for the values $k = 6, 8, 10$.

(0,0) satisfies each of these so the set of feasible solutions is below/left of each corresponding line



$L_1: 2x+3y = 6$
$L_2: 2x+3y = 8$
$L_3: 2x+3y = 10$



$-3(x+3y=6)$
$3x+y=6$
$-8y=-12$
$y=\frac{3}{2}=x$
$z(\frac{3}{2}) = 3+\frac{3}{2}$
$= 7.5$

2. Based on your sketch from the previous part, conjecture the optimal value of z. Explain (***without*** using the extreme point theorem) your reasoning.

It appears that the lines $3x+y=6$, $x+3y=6$ and $2x+3y=8$ (the line $z=8$) all intersect at a common point. For any $k>8$, the line $z=k$ won't pass throught the set of feasible solutions, so $z=8$ should be maximal.

Note: The actual point of intersection is $(\frac{3}{2}, \frac{3}{2})$ and the objective function $= \frac{15}{2}$ here. Also, different students' drawings may lead to a different conjectured optimal values of the objective function. The key to this quiz is to interpret the drawing appropiately — not to get the right "answer."