Q4.

Finding the lines that create the feasible region

① $(1,2), (3,0)$

$$m = \frac{0-2}{3-1} = -1$$

$y = -x + b \xrightarrow{(3,0)} 0 = -3 + b \Rightarrow b = 3$

$y = -x + 3$

② $(1,2), (2,-1)$

$$m = \frac{-1-2}{2-1} = -3$$

$y = -3x + b \xrightarrow{(1,2)} 2 = -3 + b \Rightarrow b = 5$

$y = -3x + 5$

③ $(3,0), (2,-1)$

$$m = \frac{-1-0}{2-3} = 1$$

$y = x + b \xrightarrow{(3,0)} 0 = 3 + b \Rightarrow b = -3$

$y = x - 3$

=> Contraints

$$\begin{cases} y + x - 3 \leq 0 \\ y - x + 3 \geq 0 \\ y + 3x - 5 \geq 0 \end{cases}$$

I used the graph, added on the last page, to figure out the equality signs.

objective function

$\alpha x + \beta y = 5$ at $(2,-1)$

decrease with bigger x & y

We want a objective function that has a value of 5 at point (2,-1) and decrease with larger x,y values, I found this function by trial and error.

trial and error:

max

$-x - 7y = Z$

$-2 + 7 = 5$ ✓

$(3,0) = -3 + 0 = -3 < 5$

$(1,2) = -1 - 14 = -15 < 5$

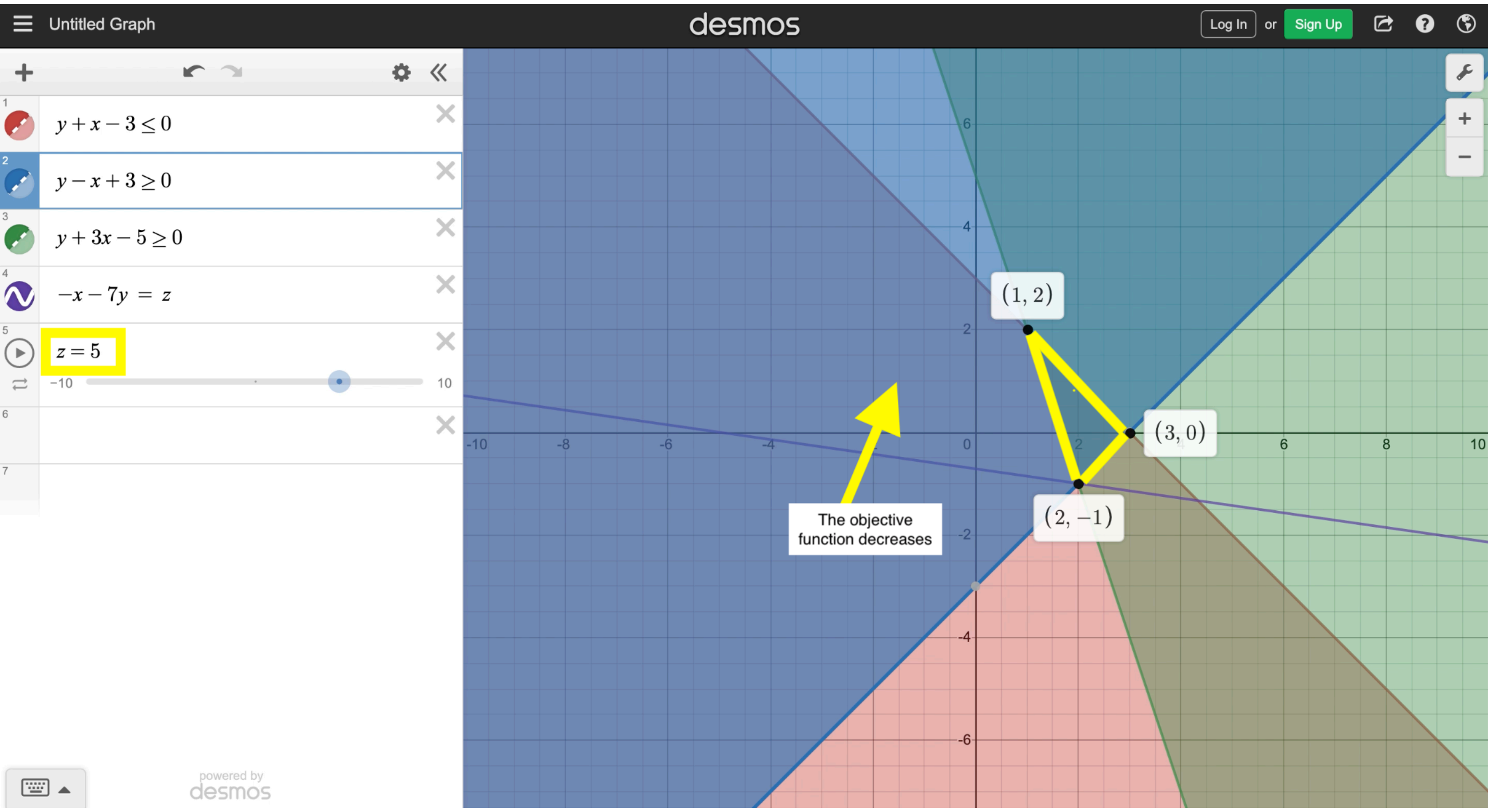
final LP:

max

$$Z = -x - 7y$$

s/t

$$\begin{cases} y + x - 3 \leq 0 \\ y - x + 3 \geq 0 \\ y + 3x - 5 \geq 0 \end{cases}$$


Untitled Graph
desmos
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$y + x - 3 \leq 0$
$y - x + 3 \geq 0$
$y + 3x - 5 \geq 0$
$-x - 7y = z$
$z = 5$
−10
10
$(1, 2)$
$(3, 0)$
$(2, -1)$
The objective function decreases
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