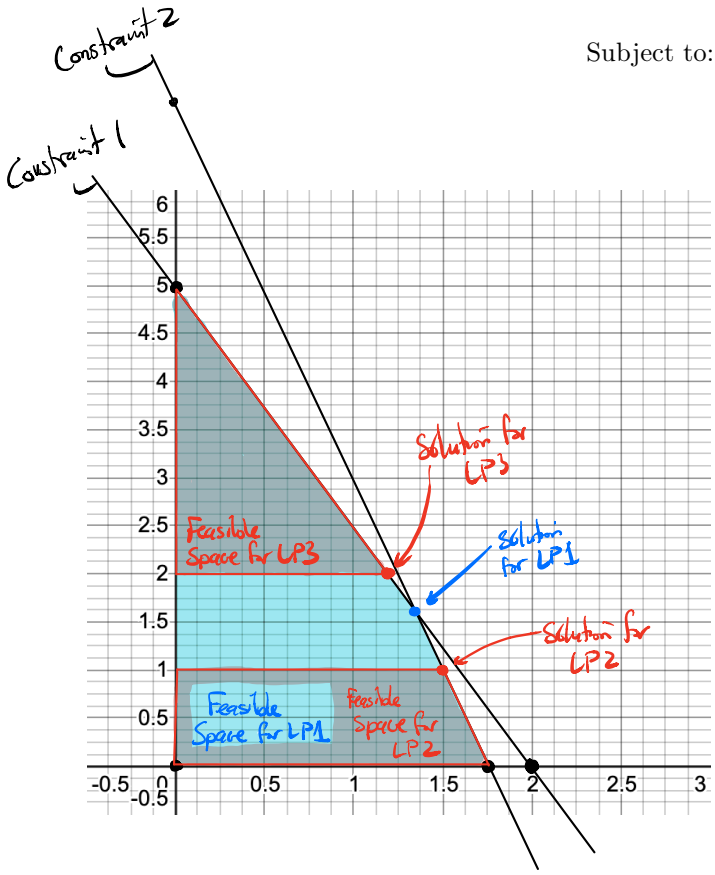
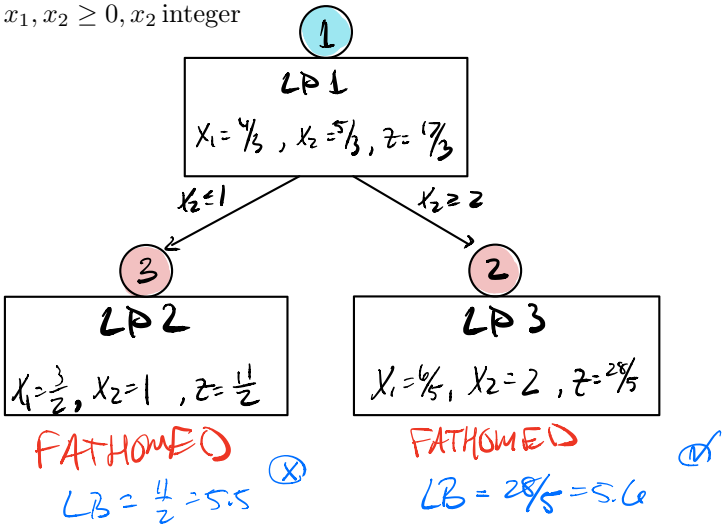
# §9.4: Branch & Bound Method for Mixed IPs

1.] Solve the following IP using the Branch-and-Bound method:

Maximize: $z = 3x_1 + x_2$

Subject to: $5x_1 + 2x_2 \leq 10$
$4x_1 + x_2 \leq 7$
$x_1, x_2 \geq 0, x_2$ integer




Solution to IP: $x_1 = 1.2$, $x_2 = 2$

$\Rightarrow$ Max $z = 5.6$

Solutions:

LP1: $5x_1 + 2x_2 = 10$, $4x_1 + x_2 = 7$ $\Rightarrow \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 5 & 2 \\ 4 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 10 \\ 7 \end{bmatrix} = \frac{1}{-3} \begin{bmatrix} 1 & -2 \\ -4 & 5 \end{bmatrix} \begin{bmatrix} 10 \\ 7 \end{bmatrix} = -\frac{1}{3} \begin{bmatrix} -4 \\ -5 \end{bmatrix} = \begin{bmatrix} 4/3 \\ 5/3 \end{bmatrix}$

LP3: $x_2 = 2 \Rightarrow 5x_1 + 2(2) = 10 \Rightarrow x_1 = \frac{6}{5}$

LP2: $x_2 = 1 \Rightarrow 4x_1 + 1 = 7 \Rightarrow x_1 = \frac{3}{2}$