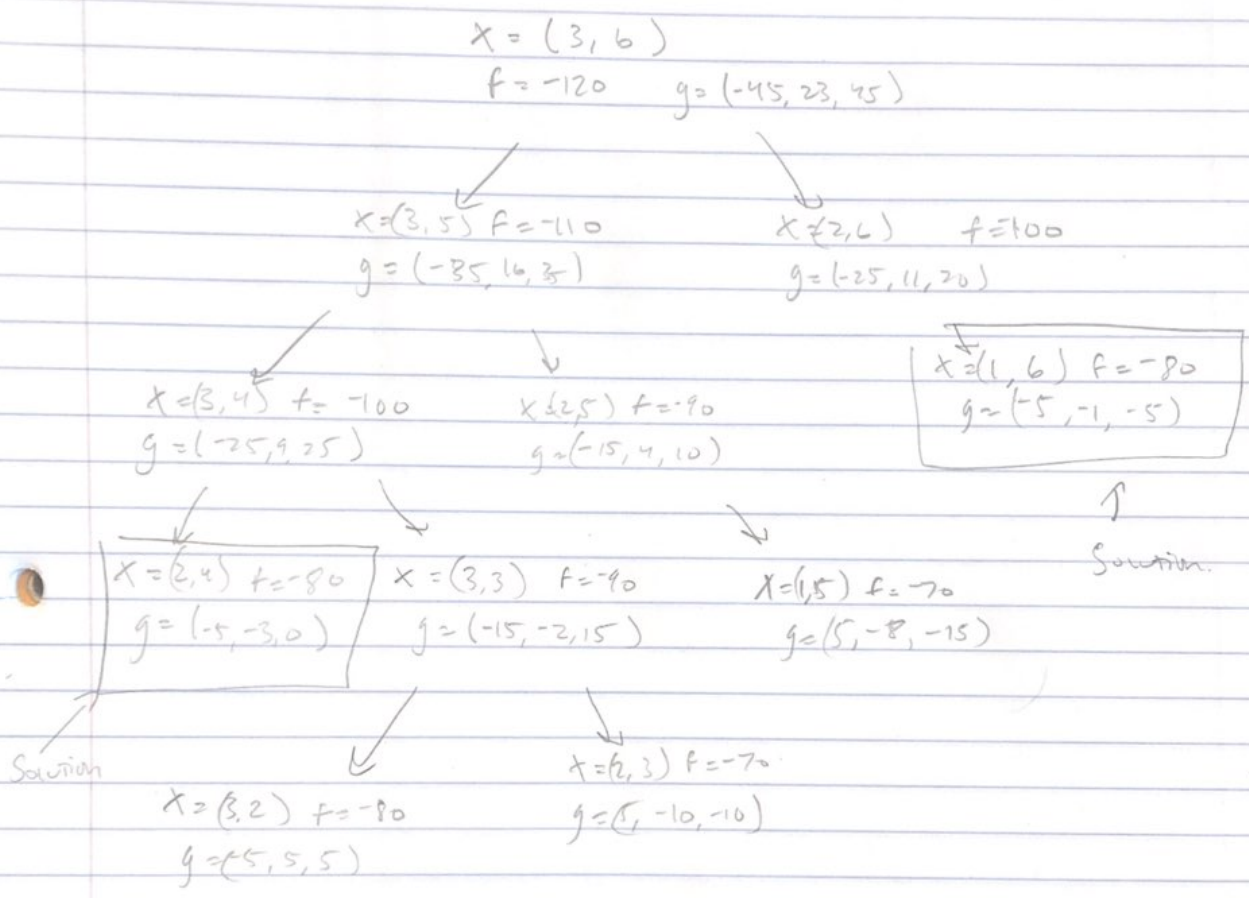
Hw 4.

1.


x = (3, 6)
f = -120
g = (-45, 23, 45)
x = (3, 5) f = -110
g = (-35, 16, 35)
x = (2, 6) f = 100
g = (-25, 11, 20)
x = (3, 4) f = -100
g = (-25, 9, 25)
x = (2, 5) f = -90
g = (-15, 4, 10)
x = (1, 6) f = -80
g = (-5, -1, -5)
Solution
x = (2, 4) f = -80
g = (-5, -3, 0)
x = (3, 3) f = -90
g = (-15, -2, 15)
x = (1, 5) f = -70
g = (5, -8, -15)
Solution
x = (3, 2) f = -80
g = (5, 5, 5)
x = (2, 3) f = -70
g = (5, -10, -10)

2. Same problem as 2, now assume diff. w/ use of a Cont. variable opt. procedure.

Solving as a continuous problem: found from MATLab.

$x^* = (1.4545, 5.3636)$

$f = -82.7$

now break it into $x_1 \leq 1$ or $x_1 \geq 2$.

for $x_1 \leq 1 \rightarrow x_1 \in [0, 1]$

$x^* = (1, 6.15)$

$f = -81.5$

for $x_1 \geq 2 \quad x_1 \in [2, \infty)$

$x^* = (2, 4)$

$f = -80$

$x_2 \leq 6$

$x^* = (1, 6)$

$f = -80$

$x_2 \geq 7$

no point satisfies constraints

Note: each step was solved in MATLab using int linprog(·).

4.

initial run

$X = [2.23, 1.95, 1, 4.35, -0.63, 1.01, 1.61]$

$f = 682 \quad g_1 = 0 \quad g_2 = -245 \quad g_3 = -147 \quad g_4 = 0.$

$= X_1 \leq 2$

$X = [2, 1.96, -1.31, 4.4, -0.6, 1.07, 1.54]$

$f = 681.37$ all constraints met

$X_1 \geq 3$

$X = [$ ☆ → done on another page

$X_2 \leq 1, X_1 = 2$

$X = [2, 1, -0.3, 5.42, -0.5, 0.9, 1.6]$

$f = 745$ note $x_3 = -0.3$

$X_2 \geq 2,$

$X = [2, 2, -1.3, 4.3, -0.6, 1.07, 1.5]$

$f = 681.54.$

Stopped because this produced X_3 to be negative

☆ Looking at $X_1 \geq 3$ now.

$X = [3, 1.96, -0.1, 4, -0.63, 0.31, 2.16]$

$f = 694$

$X_2 \leq 1$

$X = [2.17, 1, -0.3, 5.4, -0.5, 0.96, 1.67]$

$f = 744$

$X_2 > 2$

221
684

222
688

I'm not sure how this will ensure integer solutions for X_1, X_2, X_3

Solution found in MATLAB

$X^* = [2, 2, 2, 4.24, -0.63, 0.81, 1.83]$

$f = 688.47.$

Solution found using MATLAB to get estimate then changing # to integers to see which combination is the lowest.