

## MATH 354: Homework 11

Due: April 14, 2022 at 11:00 am

1. Upcoming office hours are Monday April 11 8:30-9:30 am and Thursday April 14 9-10 am.
2. Reading is Sections 4.1-2, 5.1 in Kolman and Beck, or relatedly Chapter 9 in Miller.
3. Consider Homework 1 Problem 7, the investments problem. Suppose the fund adviser receives new direction that the sum of the funds invested in the two stocks, denoted  $x_1$  and  $x_2$  in the previous problem, should be at least \$60,000. What policy should be pursued to maximize return? [Feel free to start with the final tableau from Homework 8 Problem 5, being careful about units.]
4. Use branch-and-bound to solve the following linear programming problem: A manufacturer wants to purchase two types of printing machines to emboss designs on ribbon. Model A machines can print 100 meters per minute and needs 50 square meters of floor space, whereas Model B machines can print 200 meters per minute and needs 140 square meters of floor space. Suppose the manufacturer needs to print at least 600 meters per minute and has 350 square meters of floor space. If a Model A machine costs \$22,000 and a Model B machine costs \$36,000, how many of each model should be purchased to minimize cost? For this problem you should do your computation by hand, using the dual simplex method as appropriate.
5. Use branch-and-bound to solve the following integer programming problem: maximize  $z = x_1 + 2x_2 + x_3 + x_4$  subject to

$$\begin{cases} 2x_1 + x_2 + 3x_3 + x_4 \leq 21 \\ 2x_1 + 3x_2 + 4x_4 \leq 17 \\ 3x_1 + x_2 + 2x_3 \leq 23 \\ x_1, x_2, x_3, x_4 \geq 0 \\ x_1, x_2, x_3, x_4 \text{ integers} \end{cases}$$

For this problem you should do your simplex method calculations using the calculator at <https://www.emathhelp.net/en/calculators/linear-programming/simplex-method-calculator/> or another similar tool as in class; just submit your branching tree of nodes along with a sentence describing your conclusion.