Homework 4

Math 87

Due: October 6 2023

1 One man's trash

You're at a yard sale, and have spied four crates of goods. You've estimated the value of each crate: Crate A is valued at \$5000, Crate B at \$600, Crate C at \$3500 and Crate D at \$6000. The owner has no idea what these are worth, and is selling them for \$24, \$76, \$43 and \$754 respectively. You realize that you can purchase these crates and sell them at a much higher mark up. However, you walked here and can only buy what you can carry on your person. You have 800 dollars, and can carry an estimated 85 pounds (you may change this to kilograms if you feel like you are stronger than this). Crate A weighs 75.5 pounds, Crate B weighs 2.7 pounds, Crate C weighs 3.3 pounds and Crate D weighs 6.7 pounds. Fortunately, you are taking this class, and have identified this as an integer programming problem.

1. Write the above as an integer linear program (think carefully about what values the variables can take).
2. Use the branch and bound algorithm to find the optimal solution, explaining your choices for which variables to branch on and where to prune the tree.
3. Draw the branch and bound tree for your solution.

(hint: Note that you should use linprog to solve the relaxed linear program, initially with your variables constrained between 0 and 1).

2 Max flow

Compute the max possible flow from source (node 0) to sink (node 5) for the following graph. Also identify the minimum cut: