Homework 11

This is an individual assignment. All work that you submit for credit must be your own.

1. Spencer Enterprises must choose from a set of new investment opportunities. The investment options, the net present value of future cash flows, the capital requirements, and the available capital funds over the next three years are summarized in the table below.
   a. Construct an optimization model using Python in a Jupyter Notebook to find the optimal portfolio of investment opportunities for Spencer Enterprises.
   b. What is the second best solution for this problem?
   c. What is the optimal solution if Spencer Enterprises cannot choose both the Test Market and the Advertising Campaign options?

	Net Present	Capital Requirements		
Alternative	**Value**	**Year 1**	**Year 2**	**Year 3**
Limited warehouse expansion	$4,000	$3,000	$1,000	$4,000
Extensive warehouse expansion	$6,000	$2,500	$3,500	$3,500
Test market new product	$10,500	$6,000	$4,000	$5,000
Advertising campaign	$4,000	$2,000	$1,500	$1,800
Basic research	$8,000	$5,000	$1,000	$4,000
Purchase new equipment	$3,000	$1,000	$500	$900
Capital funds available		$10,500	$7,000	$8,750

2. Scott Office Products currently manufactures desks in a single factory located in Milwaukee and distributes its products through distribution centers located in Scranton, Atlanta, and Reno. It is considering opening one or more new factories in Cleveland, Nashville, and St. Louis to meet its growing demand. The transportation costs, capacities, and fixed costs associated with the current and potential factories are provided in the table below.

	Distribution Center				
Factory	Scranton	Atlanta	Reno	**Capacity**	**Fixed Cost**
Cleveland	2	6	10	30,000	320,000
Nashville	3	4	9	15,000	175,000
St. Louis	5	9	7	30,000	300,000
Milwaukee	5	10	8	25,000	
Demand	20,000	10,000	25,000		

   a. Construct an optimization model using Python in a Jupyter Notebook to find an optimal solution for this problem.

b. What is the value, if any, of increasing the capacity of the Milwaukee factory?

c. Modify your optimization model from part (a) to identify the second best solution for this problem.