

## Problem2.

(a)

### Decision Variables:

- Price\_new: the price set for the new book
- Price\_used: the price set for the used book

### Objective Function:

M(prices) = the bookstore's contributing margin

- maximize  $M(\text{prices}) = ((\text{price\_new} - \text{cost\_new}) * \text{demand\_new}(\text{prices}) + (\text{price\_used} - \text{cost\_used}) * \text{demand\_used}(\text{prices}))$

### Constraints:

- $0.5 * \text{price\_new} \geq \text{price\_used}$  : the price for a used book cannot exceed a half price of a new book.

### Initial values:

- The same as the example: (price\_new:price\_used = 200:50)

### Optimal Solution:

- Objective contribution margin: \$20,080.75
- Optimal prices: \$300.78, \$150.39

(b)

### Additional constraints

# The average price should be no more than \$180. The average price in part a is \$207.03.

$$\text{Average\_price} = (\text{price\_new} * \text{demand\_new} + \text{price\_used} * \text{demand\_used}) / (\text{demand\_new} + \text{demand\_used})$$

$$\text{Constraint2: } 180 \geq \text{average\_price}$$

### Optimal Solution:

- Objective contributing margin: \$19,302.67
- Optimal prices: \$250.48, \$125.24