DONNA'S TREES

Donna's Trees is planning their planting strategy for year 2000 Christmas trees. Donna has allocated a total budget of \$16000 for this venture. The other limiting factors in her planning strategy are the number of acres available to plant (10 acres), the number of trucks available for shipping the trees to the markets in Seattle (one truck that can make about 20 trips during the critical time frame), and the number of person hours available for harvesting and marketing the trees during the critical time frame (2400 hours). Her plan is to plant Scotch Pine, Douglas Firs, and White Pine, each of which requires different amounts of the necessary resources per acre. For example, Scotch Pine requires about \$4000 per acre to produce and market. This figure includes all planting, harvesting, shipping, and marketing costs. The same figure is \$10000 for Douglas Fir and \$2000 for White Pine. Her target profit figures for each acre of Scotch Pine, Douglas Fir, and White Pine are \$6000, \$12000, and \$5000, respectively. Thus, per acre, their target sale prices for Scotch Pine, Douglas Fir, and White Pine are \$10000, \$22000, and \$7000, respectively. Donna has decided to model her problem as a linear program. The initial tableau associated with this model is as follows:

	SP	DF	WP	S_1	S_2	S_3	S_4	b
acres	1	1	1	1	0	0	0	10
budget	4000	10000	2000	0	1	0	0	16000
trucking	4	8	4	0	0	1	0	20
labor	500	1000	400	0	0	0	1	2400
	6000	12000	5000	0	0	0	0	0

where the cost coefficient in the z-row represent profit per acre in dollars. After applying the simplex algorithm Donna obtained the following optimal tableau:

SP	DF	WP	S_1	S_2	S_3	S_4	Mb
1	3	0	0	.0005	$-.25$	0	3
0	-100	0	0	$-.05$	-75	1	100
0	-1	0	1	0	$-.25$	0	5
0	-1	1	0	$-.0005$	.5	0	2
0	-1000	0	0	$-.5$	-1000	0	-28000

Use this information to answer the following questions. Treat each question as an isolated event. Do not carry information between questions.

1. What is the break-even sale price for an acre of Douglas Fir Christmas trees?
2. The truck used to bring the trees to Seattle can makes only one trip per day. The truck is driven to the tree nursery, the trees are harvested, loaded onto the truck, and the truck returns to Seattle. Donna has enough employees for two truck crews and so is thinking of renting a truck with identical carrying capacity for a few days. Should Donna rent the truck? If she rents the truck, how many days should she rent it for and what is the most is she willing to pay in daily rental fees?
3. Donna is flexible in adjusting her budget. She is willing to either borrow more money to invest in the Christmas tree production, or she can take some or all of the \$16000 and invest it in another project. For each dollar she invests in the other project, she gets two dollars at the end of three years.
   (a) Should Donna take out a loan, or should she invest some or all of the \$16000 in the other project?
   (b) If Donna borrows money, how much should she borrow and what is the maximum three year cumulative finance charges that can be incurred and yet maintain the profitability of the loan?
   (c) If Donna invests in the other project, how much of the \$16000 should she invest?