10.9 (1) Harvey Habit's utility function is $U(c_1, c_2) = \min\{c_1, c_2\}$, where c_1 is his consumption of bread in period 1 and c_2 is his consumption of bread in period 2. The price of bread is $1 per loaf in period 1. The interest rate is 21%. Harvey earns $2,000 in period 1 and he will earn $1,100 in period 2.

(a) Write Harvey's budget constraint in terms of future value, assuming no inflation.

(b) How much bread does Harvey consume in the first period and how much money does he save?

(c) Suppose that Harvey's money income in both periods is the same as before, the interest rate is still 21%, but there is a 10% inflation rate.

How much bread does Harvey consume in the first period and how much money does he save?

10.5 (1) Laertes has an endowment of $20 each period. He can borrow money at an interest rate of 200%, and he can lend money at a rate of 0%.

(a) Use blue ink to illustrate his budget set

(b) Laertes could invest in a project that would leave him with $m_1 = 30$ and $m_2 = 15$. Besides investing in the project, he can still borrow at 200% interest or lend at 0% interest. Use red ink to draw the new budget set in the graph above. Would Laertes be better off or worse off by investing in this project given his possibilities for borrowing or lending? Or can't one tell without knowing something about his preferences? Explain.

11.1 (0) An area of land has been planted with Christmas trees. On December 1, ten years from now, the trees will be ready for harvest. At that time, the standing Christmas trees can be sold for $1,000 per acre. The land, after the trees have been removed, will be worth $200 per acre. There are no taxes or operating expenses, but also no revenue from this land until the trees are harvested. The interest rate is 10%.

(a) What can we expect the market price of the land to be?

(b) Suppose that the Christmas trees do not have to be sold after 10 years, but could be sold in any year. Their value if they are cut before they are 10 years old is zero. After the trees are 10 years old, an acre of trees is worth $1,000 and its value will increase by $100 per year for the next 20 years. After the trees are cut, the land on which the trees stood can always be sold for $200 an acre. When should the trees be cut to maximize the present value of the payments received for trees and land?

11.4 (0) You are the business manager of P. Bunyan Forests, Inc., and are trying to decide when you should cut your trees. The market value of the lumber that you will get if you let your trees reach the age of t years is given by the function $W(t) = e^{.20t - .001t^2}$. Mr. Bunyan can earn an interest rate of 5% per year on money in the bank.

(a) If he is only interested in the trees as an investment, how old should Mr. Bunyan let the trees get?

(b) At what age do the trees have the greatest market value?

11.6 (2) Ashley is thinking of buying a truckload of wine for investment purposes. He can borrow and lend as much as he likes at an annual interest rate of 10%. He is looking at three kinds of wine. To keep our calculations simple, let us assume that handling and storage costs are negligible.

• Wine drinkers would pay exactly $175 a case to drink Wine A today. But if Wine A is allowed to mature for one year, it will improve. In fact wine drinkers will be willing to pay $220 a case to drink this wine one year from today. After that, the wine gradually deteriorates and becomes less valuable every year.

• From now until one year from now, Wine B is indistinguishable from Wine A. But instead of deteriorating after one year, Wine B will improve. In fact the amount that wine drinkers would be willing to pay to drink Wine B will be $220 a case in one year and will rise by $10 per case per year for the next 30 years.

• Wine drinkers would be willing to pay $100 per case to drink Wine C right now. But one year from now, they will be willing to pay $250 per case to drink it and the amount they will be willing to pay to drink it will rise by $50 per case per year for the next 20 years.

(a) What is the most Ashley would be willing to pay per case for Wine A

(b) What is the most Ashley would be willing to pay per case for Wine B

(c) How old will Wine C be when it first becomes worthwhile for investors

to sell off their holdings and for drinkers to drink it?

(d) What will the price of Wine C be at the time it is first drunk?

(e) What is the most that Ashley would be willing to pay today for a case of Wine C?