Example: A consumer has the utility function $U(c_1, c_2) = c_1 c_2$. There is no inflation, the interest rate is 10%, and the consumer has income 100 in period 1 and 121 in period 2.

Find the optimal consumption level in period 1 and 2.

Example: Suppose that in the previous example, there happened to be an inflation rate of 6%, and suppose that the price of period-1 goods is 1.

Find the optimal consumption level in period 1 and 2. Consider the following two cases:

    a) income is expressed in consumption units
    b) income is in money.

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%. (Note: If the interest rate is 0%, for every dollar that you save, you get back $1 in the next period. If the interest rate is 200%, then for every dollar you borrow, you have to pay back $3 in the next period.)

(a) Use blue ink to illustrate his budget set in the graph below.

(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.

(c) Consider an alternative project that would leave Laertes with the endowment $m_1 = 15$, $m_2 = 30$. Again suppose he can borrow and lend as above. But if he chooses this project, he can't do the first project. Use pencil or black ink to draw the budget set available to Laertes if he chooses this project. Is Laertes better off or worse off by choosing this project than if he didn't choose either project? Or can't one tell without knowing more about his preferences? Explain.

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. Then in period 2, a loaf of bread will cost $___. Write down Harvey's budget equation for period-1 and period-2 bread, given this new information.

10.10 (2) In an isolated mountain village, the only crop is corn. Good harvests alternate with bad harvests. This year the harvest will be 1,000 bushels. Next year it will be 150 bushels. There is no trade with the outside world. Corn can be stored from one year to the next, but rats will eat 25% of what is stored in a year. The villagers have Cobb-Douglas utility functions, $U(c_1; c_2) = c_1c_2$ where c_1 is consumption this year, and c_2 is consumption next year.

(a) Use red ink to draw a budget line, showing consumption possibilities for the village, with this year's consumption on the horizontal axis and next year's consumption on the vertical axis. Put numbers on your graph to show where the budget line hits the axes.

(b) How much corn will the villagers consume this year? How much will the rats eat?. How much corn will the villagers consume next year?

(c) Suppose that a road is built to the village so that now the village is able to trade with the rest of the world. Now the villagers are able to buy and sell corn at the world price, which is $1 per bushel. They are also able to borrow and lend money at an interest rate of 10%. On your graph, use blue ink to draw the new budget line for the villagers. Solve for the amount they would now consume in the first period

_____and the second period _____.

(d) Suppose that all is as in the last part of the question except that there is a transportation cost of $.10 per bushel for every bushel of grain hauled into or out of the village. On your graph, use black ink or pencil to draw the budget line for the village under these circumstances.