

Instructions:

Please attempt every problem. You must support every solution with an appropriate amount of work and/or description. Unsupported answers may receive a score of 0. Good luck!

1. (20 pts) In order to buy a car, you borrow \$25,000 from a friend at 12%/year compounded monthly for 4 years. You plan to repay the loan with 48 equal monthly payments.
 - (a) How much are the monthly payments?
 - (b) How much interest is in the 23rd payment?
 - (c) What is the remaining balance after the 37th payment?
 - (d) Three and one-half years after borrowing the money, you decide to pay off the loan. You have not yet made the payment due at that time. What is the payoff amount for the loan?

Solution: $P = 25,000$, $n = 4 \times 12 = 48$. The monthly interest rate

is $i = \frac{0.12}{12} = 0.01$

$$a) \quad A = P \left[\frac{i(1+i)^n}{(1+i)^n - 1} \right] = 25000 \times \left[\frac{0.01 \times (1+0.01)^{48}}{(1+0.01)^{48} - 1} \right] = \$658.3459.$$

$$b) \quad U_{22} = A \times \left[\frac{(1+i)^{n-t} - 1}{i(1+i)^{n-t}} \right] = 658.3459 \times \left[\frac{(1+0.01)^{48-22} - 1}{0.01(1+0.01)^{48-22}} \right] = 1500.13.$$

$$I_{23} = i \cdot U_{22} = 0.01 \times 1500.13 = \$15.0013$$

$$c) \quad U_{37} = 658.3459 \times \left[\frac{(1+0.01)^{48-37} - 1}{0.01(1+0.01)^{48-37}} \right] = 6825.4855$$

$$d) \quad t = 3 \times 12 + 6 = 42.$$

$$\text{Payoff}_{42} = A + U_{42} = 658.3459 + 658.3459 \left[\frac{(1+0.01)^{48-42} - 1}{0.01 \times (1+0.01)^{48-42}} \right] = \$4473.7741$$