Problem 41 of 2.2: A recent advertisement says you can own a certain car for 149 down and 140 per month for 60 months. The purchase price of the car is 7200. If your money is earning 9% per *year* in the bank, is it better to buy the car on the payment plan or with cash? How much will you save in present value dollars if you use the better method?

Solution: Imagine that you choose the payment plan. Then you first pay 149 to the car seller, then put $7200 - \$149 = \$7051$ in your bank account. Each month, you receive interest from the bank and then pay 149 to the car seller. The payment plan would be better than paying by cash if your account balace at the end of 60 months is positive. This would be the case if the present value of account balance is greater than the present value of the payment stream flowing out of the account.

The periodic interest rate is $r = 9\%/12 = 0.0075$. The present value of your account balance is 7051. The present value of your annuity is

$$\frac{P}{r}\left(1 - \left(\frac{1}{r+1}\right)^n\right) = \frac{149}{0.0075}\left(1 - \left(\frac{1}{0.0075 + 1}\right)^{60}\right) \approx 7177.83$$

Here the present value of the payment stream flowing out your account is larger than the present value of your balance by

$$\$7177.83 - \$7051 = \$126.83$$

Therefore, if you use the payment plan, you would lose 126.83 compared to paying off the car by cash.