Name:_____

MATH 1090-9: QUIZ 10[1]

December 6, 2007

calculators are optional!

(You may leave your solution in a form which can be entered into a calculator to get a numerical answer.)

1. Suppose $\$200,000$ is used to establish an ordinary annuity that earn 6% annually (compounded quarterly) and which pays $\$4,500$ at the end of each quarter. How long will it be until the account balance is \$0?

Solution. Here $A = 200,000$, $R = 4500$, $i = 0.06/4 = 0.015$, and we seek n in the following equation:

$$200000 = 4500 \cdot \left[\frac{1-(1+0.015)^n}{0.015}\right].$$

We isolate the exponential and find

$$1.015^{-n} = 1 - \frac{200000 \cdot 0.015}{4500}.$$

So

$$n = -\frac{\ln\left(1 - \frac{200000 \cdot 0.015}{4500}\right)}{\ln(1.015)}$$

which give $n \approx 74$ quarters (which is about 18 and a half years).

2. What is the monthly payment on a $\$100,000$ 30-year mortgage at an annual interest rate of 9%?

Solution.

$$\begin{aligned} R &= 100000\left[\frac{0.09/12}{1-(1+(0.09/12))^{-360}}\right] \\ &= \$804.62. \end{aligned}$$

[1] Present value of ordinary annuity formula (§6.4):

$$A_n = R \cdot \left[\frac{1-(1+i)^{-n}}{i}\right].$$

Amortization formula (§6.5):

$$R = A_n \cdot \left[\frac{i}{1-(1+i)^{-n}}\right].$$