MATH 1030-004, Quiz 5 Solution **Spring 2011**

1. You borrowed \$80,000 at an APR of 7% which you are paying off with monthly payments of \$620 for 20 years. **(4 pts)**

   (a) Clearly identify the starting loan principal, the interest rate, the number of payments per year, the loan term, and the payment amount.

   The starting loan principal = \$80,000; the interest rate = 7%; there are 12 payments per year; the loan term = 20 years; the payment amount = \$620.

   (b) How many payments will you make in total?

   There are 12 payments every year for 20 years, so

   $$12 \times 20 = 240.$$

   (c) What total amount will you pay over the full term of the loan?

   $$240 \times \$620 = \$148,800.$$

   (d) Of the total amount you pay, how much will go toward principal, and how much toward interest?

   Toward Principal = \$80,000,

   Toward Interest = \$148,800 - \$80,000 = \$68,800.

2. A friend creates an IRA with an APR of 6.25%. She starts the IRA at age 25 and deposits \$50 per month. How much will her IRA contain when she retires at age 65? Compare that amount to the total deposits made over the time period. **(3 pts)**

$$A = PMT \times \frac{\left(1 + \frac{APR}{n}\right)^{nY} - 1}{\left(\frac{APR}{n}\right)}$$

$$A = \$50 \times \frac{\left(1 + \frac{0.0625}{12}\right)^{12 \times 40} - 1}{\left(\frac{0.0625}{12}\right)} = \$106,596.$$

Total deposits = $\$50 \times 12 \times 40 = \$24,000$.

3. Your goal is to create a college fund for your child. Suppose you find a fund that offers an APR of 5%. How much should you deposit monthly to accumulate $85,000 in 15 years? **(3 pts)**

$$A = PMT \times \frac{\left(1 + \frac{APR}{n}\right)^{nY} - 1}{\left(\frac{APR}{n}\right)}$$

$$\$85,000 = PMT \times \frac{\left(1 + \frac{0.05}{12}\right)^{12\times 15} - 1}{\left(\frac{0.05}{12}\right)}$$

$$\$85,000 = PMT \times 267.29$$

$$PMT = \frac{\$85,000}{267.29} = \$318.$$

4. Suppose you have a home mortgage of $200,000 with a fixed APR of 7.5% for 30 years.

   (a) Calculate the monthly payment. **(2 pts)**

$$PMT = \frac{P \cdot \left(\frac{APR}{n}\right)}{1 - \left(1 + \frac{APR}{n}\right)^{-nY}}$$

$$PMT = \frac{\$200,000 \times \left(\frac{0.075}{12}\right)}{1 - \left(1 + \frac{0.075}{12}\right)^{-12\times 30}} = \$1,398.43.$$

   (b) Determine the total amount paid over the term of the loan. **(2 pts)**

   Total amount paid $= \$1,398.43 \times 12 \times 30 = \$503,434.$

   (c) Of the total amount paid, *what percentage* is paid toward the principal and *what percentage* is paid for interest? **(Extra Credit: 2 pts)**

   Toward principal $= \$200,000/\$503,434 = 39.7\%,$

   Toward interest $= 100\% - 39.7\% = 60.3\%.$