CC Algebra 2R
Unit 9 – Exponentials HW **9-10**

Name: _____

$A_f = R\left(\frac{(1+i)^n - 1}{i}\right)$ Savings

$A_p = R\left(\frac{1-(1+i)^{-n}}{i}\right)$ mtg & cars Loans

1. Suppose you want to buy a $30,000 car with a 5-year loan at **4. 5%** annual interest paying **10%** down.

   a. How much do you pay toward the loan on the car each month?

   $30000(.1) = 3000$
   $27000 loan

   $27000 = R\left(\frac{1-\left(1+\left(\frac{.045}{12}\right)\right)^{-(5\cdot 12)}}{\left(\frac{.045}{12}\right)}\right)$

   Ap

   b. What is the total monthly payment on this car? How much interest did you pay?

   $503.36 (60) = 30201.69
   − 27000
   $3201.69 in interest

2. In the summer of **2014**, the average listing price for homes for sale in the Hollywood Hills was **$2,663,995**.

   a. Suppose you want to buy a home at that price with a **30**-year mortgage at **5. 25%** annual interest, paying **10%** as a down payment. What is your total monthly payment on this house?

   $2663995(.1) = 266399.50$

   mtg amt: 2397595.50

   $2397595.50 = R\left(\frac{1-\left(1+\left(\frac{.0525}{12}\right)\right)^{-(30\cdot 12)}}{\left(\frac{.0525}{12}\right)}\right)$

   $R = 13239.61$

   Ap

   b. How much is paid in interest over the life of the loan?

   13239.61 (360 months) = 4766259.60 (total pd)
   − 2397595.50 (mtg amt)
   $2368664.10 interest

$$A_f = R\left(\frac{(1+i)^n - 1}{i}\right) \qquad A_p = R\left(\frac{1-(1+i)^{-n}}{i}\right)$$

÷12

3. Suppose you want to buy a $200, 000 home with a 30-year mortgage at 4. 5% annual interest paying 10% down.

(.10) ↳ 180,000 mtg

What is the monthly payment on the house loan?

$$180,000 = R\left(\frac{1-\left(1+\left(\frac{.045}{12}\right)\right)^{-(30\cdot 12)}}{\left(\frac{.045}{12}\right)}\right)$$

Ap

$R = \$912.03$

4. Suppose you made monthly $25 deposit into an account that pays 9% APR compounded monthly. What is the value of the account after 47 years???

As

$$A_f = 25\left(\frac{\left(1+\left(\frac{.09}{12}\right)\right)^{(12\cdot 47)} - 1}{\left(\frac{.09}{12}\right)}\right) = \$22,137.13$$

How much of your own money did you invest and how much interest did you earn?

$\$25\ (12 \text{ months})(47 \text{ yrs}) = \$14,100$

$222,137.13 - 14,100 = 208,037.13$

(over)

$$A_f = R\left(\frac{(1+i)^n - 1}{i}\right) \qquad A_p = R\left(\frac{1-(1+i)^{-n}}{i}\right)$$

5. Suppose that you would like to buy a home priced at $\$200,000$. You will make a payment of 10% of the purchase price.

(.10) → 180000

a. Compute the total monthly payment for a 15-year mortgage at 4.8% annual interest.

.048/12

A_p

$$180000 = R\left(\frac{1-(1+\frac{.048}{12})^{-(15\cdot 12)}}{(\frac{.048}{12})}\right)$$

$$180000 = R(128.137\ldots)$$

$$R = \$1404.75$$

b. Calculate the total interest paid over the life of the loan.

(180 months) =

252,855 total pd

252855
−180000
$\$72855$ interest

SAVINGS $A_f = R\left(\frac{(1+i)^n - 1}{i}\right)$ MORTGAGES/CARS/LOANS $A_p = R\left(\frac{1-(1+i)^{-n}}{i}\right)$

5. Suppose that you would like to buy a home priced at $\$200,000$. You will make a payment of 10% of the purchase price.

   a. Compute the total monthly payment for a 15-year mortgage at 4.8% annual interest.

   b. Calculate the total interest paid over the life of the loan.

6. Another way to determine the monthly payment, **m**, for a certain principal, **P**, at a specific monthly rate, **r**, is the use the formula below. **n**, represents the number of payment it takes to pay off the loan.

$$m = \frac{P \bullet r}{1-(1+r)^{-n}}$$

   a) Calculate the monthly payment needed to pay off a $200, 000 loan at 4% annual interest over a 20 year period.

$20(12)$

$$m = \frac{200000 \bullet \left(\frac{.04}{12}\right)}{1-\left(1+\frac{.04}{12}\right)^{-240}}$$

$m = \$1211.96$

   b) Do the same calculation but now make the pay off period 30 years instead of 20 years. How much less is the monthly payment?

$30(12) = 360$

$$m = \frac{200000 \cdot \left(\frac{.04}{12}\right)}{1-\left(1+\frac{.04}{12}\right)^{-360}} = 954.83$$

$1211.96 - 954.83$

$\$257.13$ less

but ... →

1211.96 (240 pymts) = 290870.40 - 200000 = interest = 90,870.40

954.83 (360 pymts) = 343738.80 - 200000 = 143,738.80 interest

343738.80
- 290870.40
52868.40

52,868.40 more in interest! just to lower your monthly payment