POST-QUIZ ENRICHMENT ASSIGNMENT **Name:** Key

IM 3: 12.1-12.3

1.) To introduce a property tax increase, one city decided to charge residents their current amount in January, then increase by 0.8% each month. Complete the table, then answer the questions.

Month	Amount
1	$500
2	$504
3	$508.63
4	$512.10
5	$516.19

a. Write a rule for the geometric sequence that represents the data in the table.

$A_n = 500(1.008)^{t-1}$

b. Rewrite the rule above as a function A(t) to model the amount of taxes after t months.

$A(t) = 500(1.008)^t \cdot (1.008)^{-1}$

$A(t) = 500 \cdot \frac{1}{1.008} \cdot 1.008^t$

$A(t) = \frac{31250}{63}(1.008)^t$

c. How much will a resident owe in December?

$A(12) = \frac{31250}{63}(1.008)^{12} = \$545.80$

d. Assuming the city will continue this system, how many months before the taxes are at $600 for the month? Use your graphing calculator to figure it out.

24 months

2.) At the start of a business conference, all 225 attendees are taking notes. Each hour, though, people lose interest and stop. The table shows the number of attendees taking notes each hour.

Hour	People taking notes
0	225
1	180
2	144
3	115

a. Write a rule for the geometric sequence that represents the data in the table.

$A_n = 180(.8)^{t-1}$

b. Rewrite the rule above as a function A(t) to model the number of people taking notes after t hours ~~(be careful…notice the data starts with a "0" value)~~

$A(t) = 180(.8)^t \cdot (.8)^{-1}$

$A(t) = 180 \cdot \frac{1}{.8} \cdot .8^t$

$A(t) = 225(.8)^t$

c. How many people will still be taking notes at hour 7?

$A(7) = 225(.8)^7 = 47$ people

3.) ~~Write a function A(t), where t represents elapsed time, to represent the half-life situation. Fill in the missing cells in the table. Round to the nearest hundredth.~~

Elapsed time (minutes)	0	15	30	72
Aspirin in your system (mg)	500	250	125	17.95
Number of Half-Life Cycles	0	1	2	4.8

a. Write a function A(t), where t represents elapsed time, to represent the half-life situation.

$A(t) = 500\left(\frac{1}{2}\right)^{t/15}$

b. Fill in the missing cells in the table. Round to the nearest hundredth.

4.) The half-life of caffeine is 5.7 hours. You drank 3 cups of coffee at 8:00 AM, which contains a total of 285 mg of caffeine. How much caffeine remains in your system at 5:00 PM?

$A(t) = 285\left(\frac{1}{2}\right)^{9/5.7} =$ 95.40 mg

5.) Bob deposits \$6000 into an account that pays 0.3% interest, compounded monthly.

a. How much money will Bob have after 5 years?

$A = 6000\left(1 + \frac{.003}{12}\right)^{12 \cdot 5} =$ \$6090.67

b. Bob found another bank that pays 0.5% interest, compounded semiannually. Will this bank be a better choice, assuming the same 5 year time period?

$A = 6000\left(1 + \frac{.005}{2}\right)^{2 \cdot 5} =$ \$6151.70 yes!

c. Use your graphing calculator to determine how long it will take Bob to double his money at both banks.

Bank 1: 232 months

Bank 2: 139 months

6.) A population growing continuously can be modeled with the function $A(t) = A_0 e^{rt}$. Orlando, Florida's population was 2.3 million people in 2014, and the rate of growth is 2.2%.

a. What will the population of Orlando be in 2020?

$A(6) = 2{,}300{,}000\, e^{.022 \cdot 6} =$ 2,624,549 people

b. Use your graphing calculator to determine the year that Orlando's population will exceed 3 million.

$t = 13 \rightarrow$ Year 2027