**Unit II Journal – Chapters 4 & 9 Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Respond to each item, giving sufficient detail. Neatly handwrite your responses. *This should be very helpful to you as you prepare for exams.*

1. Complete the following exponent rules chart. Show clear use of the properties.

|  |  |
| --- | --- |
| **Rule** | **Example** |
| am ⋅ an = am + n | 53 ⋅ 54 = \_\_\_\_ |
|  |  |
| a0 = 1 , a ≠ 0 | 100 = |
| (am )n = am ⋅ n | (32 )5 = |
|  |  |

2. The simple interest formula is I = \_\_\_\_\_\_\_\_\_\_ , where P represents the original amount (principal), APR represents the interest rate, and Y represents the time in years.

Calculate the amount of money you have in the following account after 5 years, assuming that you earn simple interest, if you deposit $1,000 in an account with an annual interest rate of 3.5%. Show your work.

3. The compound interest formula for the accumulated amount of an investment is



where P is the starting principal, APR is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and n is the total number of compounding periods per year. \_\_\_\_\_\_ is the number of years (which may be a decimal number).

Common numbers of compoundings include 1 for annually, 2 for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ,

\_\_\_\_\_\_ for quarterly, 12 for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , \_\_\_\_\_\_ for weekly, and 360 (or, sometimes, 365) for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

4. If interest is compounded “continuously” (an infinite number of times each year), we use a new formula for the accumulated amount, A = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ , where P is the principal, APR is the annual percentage rate, and Y is the number of years.

The number e is (like π) a transcendental number and is approximately \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

Use the compound interest formula to compute the balance for an investment of $1,500 at an APR of 2.5% for 5 years. Assume continuous compounding. Show your work.

5. (a) Use the compound interest formula to compute the balance for an investment of $1,500 at an APR of 4% for 5 years. Assume quarterly compounding. Show your work.

(b) Use the compound interest formula to compute the balance for an investment of $1,500 at an APR of 4% for 5 years. Assume monthly compounding. Show your work.

(c) Use the compound interest formula to compute the balance for an investment of $1,500 at an APR of 4% for 5 years. Assume daily compounding. Show your work.

(d)&(e) Then compute the annual percentage yield (APY) for part (a) and part (b). Round   
 to the nearest hundredth of a percent. Show your work.

6. The savings plan formula, with regular payments, is



where A = the accumulated savings plan balance or future value,

PMT = the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (deposit) amount,

APR = the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (as a decimal), &

n = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Y = the number of years

We assume that the initial principal is $0 before the payments begin.

Find the savings plan balance after 12 months with an APR of 3% and monthly payments of $150. Show the formula setup and the solution.

7. The total return is the percentage change in the investment value from the original principal, P, to a later accumulated balance, A. Complete the formula below.

Total return = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The annual return is the annual percentage yield (APY) that would give the same overall growth over Y years. Complete the formula below.

Annual return = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Compute the annual and total returns for the following scenario: Five years after buying 100 shares of XYZ stock for $50 per share, you sell the stock for $7,500. Show your work.

8. An exponential function grows (or decays) by the same amount per unit of time. For any quantity Q growing exponentially with a fractional growth rate r,

Q = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ,

where Q = the value of the exponentially growing quantity at time t,

Q0 = the \_\_\_\_\_\_\_\_\_\_ value of the quantity (at t = 0),

r = the fractional growth rate (which may be positive or negative) for the quantity, &

t = time

Negative values of r correspond to exponential decay; positive values of r correspond to

exponential \_\_\_\_\_\_\_\_\_\_ . The units of time used for t and r must be the same. For example, if the growth rate is 5% per month, then t must also be measured in months; if the growth rate is 5% per year, then t must be measured in \_\_\_\_\_\_\_\_\_\_ .

A city’s population starts at 100,000 people and grows 5% per year.

(a) What is the general formula for the population growth of this city?

Q = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b) Then find the population 7 years later. Round to the nearest person. Show your work.

9. Start with the general equation, Q = Q0(1 + r)t.

Substituting Q = 2Q0 and t = Tdouble, we have 2Q0 = Q0(1 + r)Tdouble.

Dividing both sides by Q0, we have 2 = (1 + r)Tdouble.

Raising both sides to the power 1/Tdouble, we have 21/Tdouble = 1 + r.

Then substituting the expression for 1 + r into the general equation, we have

Q = Q0 × (21/Tdouble)t = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ .

This formula is used when the initial amount, Q0, is known and the time it takes for the amount to double, Tdouble, is also known.

A city’s population starts at 100,000 people and doubles every 14 years.

(a) What is the general formula for the population growth of this city?

Q = \_\_\_\_\_\_\_\_\_\_ × 2\_\_\_\_\_\_\_\_\_\_\_

(b) Then find the population 7 years later. Round to the nearest person. \_\_\_\_\_\_\_\_\_\_\_\_\_\_

A similar formula is used when the initial amount, Q0, is known and the time it takes for the amount to halve, Thalf, is also known.

 We will revisit both of these alternative formulas in Section 8B.

10. Write a few sentences describing something you learned that was new for you in class this unit. You may include a favorite activity, an interesting application, a teaching and learning technique, or a specific concept that you better understand as a result of this unit.

**Do your best! Rise to the challenge! Live and learn!**