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
$a^m \cdot a^n = a^{m+n}$	$5^3 \cdot 5^4 =$ _____
$\dfrac{a^m}{a^n} = a^{m-n}$	$\dfrac{8^6}{8^2} =$ ______
$a^0 = 1,\ a \neq 0$	$10^0 =$ ______
$(a^m)^n = a^{m \cdot n}$	$(3^2)^5 =$ ______
$a^{-n} = \dfrac{1}{a^n}$	$10^{-2} =$ _____

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

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

   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

$$A = PMT \times \frac{\left[\left(1+\frac{APR}{n}\right)^{(n \cdot Y)} - 1\right]}{\left(\frac{APR}{n}\right)}$$

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,

Q_0 = 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, $Q = Q_0(1 + r)^t$.

Substituting $Q = 2Q_0$ and $t = T_{double}$, we have $2Q_0 = Q_0(1 + r)^{T_{double}}$.

Dividing both sides by Q_0, we have $2 = (1 + r)^{T_{double}}$.

Raising both sides to the power $1/T_{double}$, we have $2^{1/T_{double}} = 1 + r$.

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

$$Q = Q_0 \times (2^{1/T_{double}})^t = \underline{\hspace{5cm}} .$$

This formula is used when the initial amount, Q_0, is known and the time it takes for the amount to double, T_{double}, 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?

$$Q = \underline{\hspace{2.5cm}} \times 2^{\underline{\hspace{1.5cm}}}$$

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

A similar formula is used when the initial amount, Q_0, is known and the time it takes for the amount to halve, T_{half}, is also known.

$$Q = Q_0 \times \left(\frac{1}{2}\right)^{t/T_{half}}$$ 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!