MTH 1311 – Mathematics for Business Analysis

Hello and Welcome to the weekly resources for MTH 1311 - Mathematics for Business Analysis!

This is Week 13 of class, and typically at this point in the semester, your professors are covering the topics listed below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

We also invite you to look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester. If you have any questions about these study guides, group tutoring sessions, private 30-minute tutoring appointments, the Baylor Tutoring YouTube channel, or any tutoring services we offer, please visit our website at www.baylor.edu/tutoring or call our drop-in center during open business hours: M–Th 9am–7pm on class days at 254-710-4135.

Key Words: Future Value, Compound Interest, APY, Continuous Compounding, Ordinary Annuity, Annuity Due

Topic of the Week: Simple/Compound Interest & Foundational Annuities (Sections G.1 & G.2)

Highlight 1: Core Financial Interest Equations

Chapter G focuses on the time value of money, modeling how capital changes over time under various interest structures. You will be provided a formula sheet on your exams, so your primary goal is matching a business scenario to its correct mathematical structure:

Simple Interest: Interest is calculated strictly on the original principal amount over the duration of the timeline (***I = Prt***).

Periodic Compound Interest: Interest is computed on both the initial principal and the accumulated interest from previous periods. The interest is added to the balance at fixed intervals (e.g., monthly, quarterly):

$$F = P\left(1 + \frac{r}{m}\right)^{mt}$$

Where F is the future value, P is the present value principal, r is the annual interest rate (as a decimal), m is the number of compounding periods per year, and t is the total time in years.

Continuous Compound Interest: Interest compounds constantly, an infinite number of times per year utilizing the natural base-e function:

$$F = Pe^{rt}$$

Annual Percentage Yield (APY): This represents the true, effective annual rate earned taking compounding into account. It is highly useful for comparing different bank accounts:

$$APY = \left(1 + \frac{r}{m}\right)^{m} - 1$$

Highlight 2: Differentiating Single Deposits from Annuities

The key to navigating financial mathematics exams is classifying the payment structure instantly.

Lump-Sum Compound Interest: Used when a **single deposit** (P) is made into an account today and is left untouched to grow over time. No additional payments or withdrawals ever occur.

Annuity Structures: Used when a **continuous stream of equal, recurring payments** (PMT) is made into an account at fixed regular intervals (such as saving $200 at the end of every month).

Ordinary Annuity: Payments are deposited at the *end* of each compounding period.

Annuity Due: Payments are deposited at the *beginning* of each compounding period. Because money deposited at the start of a period has an extra interval to accrue interest, an Annuity Due will always accumulate slightly more future value than an Ordinary Annuity.

Things Students Might Struggle With

- **Misinterpreting the Compounding Frequency Variable (m):** Students frequently mismatch the value of m in their calculators. Remember to memorize these standard calendar breakdowns: *annually* (m=1), *semiannually* (m=2), *quarterly* (m=4), *monthly* (m=12), and *daily* (m=365).
- **Failing to Match Percentages to Decimals:** Entering an interest rate directly as a whole number (like plugging in $6 instead of $0.06 for a 6% rate) will yield massive, impossible numbers. Always slide the decimal point two spaces to the left before calculating!

- **Mixing up Present Value (P) and Future Value (F):** Present value represents a lump sum of money standing in hand *today*. Future value represents a larger financial accumulation goal waiting for you down the line. Look closely for timeline phrases to determine which variable holds the known value!

Check Your Learning Workspace

Problem 1: Evaluating Capital Growths and Interest Frameworks

Consider the following financial account allocations:

- **Part A:** A corporate investment group places a single lump-sum deposit of $12,000 into a high-yield mutual fund offering an annual interest rate of 5.5% compounded quarterly. Calculate the total future value sitting in the account after exactly 6 years.
- **Part B:** A tech start-up deposits a single lump-sum investment of $25,000 into an account that earns 4.8% interest compounding continuously. Determine the total future value accumulated after 4 years.

Closing Comments

Financial mathematics is all about identifying the payment pattern. If you notice a single deposit with zero follow-up payments, stick strictly to your basic lump-sum compound interest or continuous equations. Let your formula definitions lead the way and always take your time identifying your time metrics (m and t)!

Answers to the Check Your Learning Problems

Problem 1 Answers:

- **Part A:** Because this involves a single initial deposit, utilize the periodic compound interest formula. Extract your variables from the prompt text: P = $12,000, r = 0.055, m = 4 (quarterly), and t = 6 years.

$$F = P\left(1 + \frac{r}{m}\right)^{mt}$$

$$F = 12000\left(1 + \frac{0.055}{4}\right)^{(4)(6)} = 12000(1.01375)^{24}$$

Final Answer: The future value of the account after 6 years is $16,655.19.

Part B: The presence of the keyword "continuously" signals that you must employ the continuous compounding formula ($F = P e^{rt}$. Extract your variables: P = $25,000, r = 0.048, and t = 4 years.

$$F = 25000 \cdot e^{(0.048)(4)}$$

$$F = 25000 \cdot e^{0.192}$$

Evaluate using your calculator's e^x key:

$$F \approx 25000(1.21167) \approx 30291.7656$$

Final Answer: The future value under continuous compounding after 4 years is $30,291.77.