

Student Name: _____

Purdue ID: _____



**MA 373 – Spring 2025
Quiz 1**

**MA 175 11:25 – 11:45 AM
Thursday, January 30th, 2025**

INSTRUCTIONS

- Do not open this quiz until you are told to do so.
- There are 20 points possible from 4 problems, 2 worth 4 points and 2 worth 6 points.
- You have 20 minutes to complete this quiz.
- Be sure you have filled in your name and Purdue ID in the slots at the top of the page.
- Show all work to maximize partial credit.
- Be sure all cell phones are silenced and put away out of view. This policy applies to smart watches as well.
- Headphones are not permitted unless prior approval was granted by your instructor.
- Formula sheets are not permitted.
- You are only permitted to use calculator(s) from the following list:
 - BA II Plus
 - BA II Plus Professional
 - BA-35
 - TI-30Xa or TI-30XA (same model just different casing)
 - TI-30X II (IIS solar or IIB battery)
 - TI-30XS MultiView (or XB battery)
- When time expires, put your pencil down and close your exam. Failure to do so will result in automatic disqualification from obtaining University-Earned Credit.

PURDUE HONORS PLEDGE

“As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do.
Accountable together - we are Purdue.”

STUDENT AGREEMENT

By signing below,

- I agree with the Purdue Honors Pledge stated above.
- I will not give or receive any assistance on this exam, and I will report any infractions of the honors pledge.
- I acknowledge that I only used calculator(s) from the above list.
- I am claiming all work in this exam as my own.

X _____

1. (4 points) You want to purchase a house at the end of six years. You invest K now in a bank in order to have a down payment of 25,000 at the end of six years. The bank pays an annual compound interest rate of 4% for the first 4 years. During the last two years, the bank pays an annual compound interest rate of 6%.

Determine the amount K that you must invest now to have exactly the down payment of 25,000 in six years.

Solution:

$$K(1+0.04)^4(1+0.06)^2 = 25,000$$

$$K = 19,019.32$$

Points	
1	Correct equation of value
2	1 point for correct accumulation for the first two years 1 point for correct accumulation for the final four years
1	Correct exponents on accumulation functions

2. (4 points) You take out a 3-year loan and receive 100 at time 0 that accumulates according to the following effective discount rates:

a. $d_1 = 0.041$

b. $d_2 = 0.045$

c. $d_3 = 0.047$

Calculate the annual effective interest rate for this loan.

Solution:

$$100 \left(\frac{1}{1-0.041} \right) \left(\frac{1}{1-0.045} \right) \left(\frac{1}{1-0.047} \right) = 114.5737481$$

$$100(1+i)^3 = 114.5737481$$

$$i = 0.0463935$$

Points	
2	Correct accumulation with effective discount rates
2	Correct setup for effective interest rate

3. (6 points) You are given that:

a. $v(t) = \frac{1}{2\alpha + \beta t^2}$

b. $i_{[5,6]} = 0.12$

Solve for β . Please show all work.

Solution:

$$a(t) = \frac{1}{v(t)} = 2\alpha + \beta t^2$$

$$a(0) = 1 = 2\alpha + \beta(0^2) \Rightarrow 2\alpha = 1 \Rightarrow \alpha = 0.5$$

$$i_{[5,6]} = 0.12$$

$$= \frac{a(6) - a(5)}{a(5)}$$

$$= \frac{(2(0.5) + \beta(6^2)) - (2(0.5) + \beta(5^2))}{(1 + \beta(5^2))}$$

$$= \frac{1 + 36\beta - (1 + 25\beta)}{1 + 25\beta}$$

$$\Rightarrow \frac{11\beta}{1 + 25\beta} = 0.12$$

$$\Rightarrow 11\beta = 0.12(1 + 25\beta)$$

$$\Rightarrow 8\beta = 0.12$$

$$\Rightarrow \beta = 0.015$$

Points	
2	Correct setup to find alpha
4	Correct setup for effective interest rate in the 6 th year • 2 points for correct formula • 2 points for correctly solving for beta

4. (6 points) Person A invests 5,000 in an account earning simple interest of 10% per year.

Person B invests 5,000 in an account earning compound interest.

During the 10th year, they earn the same annual effective interest rate.

How much money does Person B have at the end of 15 years?

Solution:

$$\text{Person A} \implies i_n = \frac{s}{1 + s(n-1)} \implies i_{10} = \frac{0.10}{1 + (0.10)(10-1)} = 0.052631579$$

$$\text{Person B} \implies i_n = i \implies i_{10} = 0.052631579 \implies i = 0.052631579$$

$$\text{Person B has } (5,000)(1.052631579)^{15} = 10,792.35$$

Points	
2	Correct setup Person A effective interest rate in 10 th year
2	Correct recognition that effective interest rate constant for Person B
2	Correct accumulation of 5,000 to end of 15 years