

Student Name: \_\_\_\_\_

Purdue ID: \_\_\_\_\_



**MA 373 – Spring 2025  
Quiz 4**

**MA 175 11:20 – 11:45 AM  
Thursday, April 17<sup>th</sup>, 2025**

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**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 25 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) A 12-year bond with a face amount of 2,500 has a maturity value of  $C$ . The bond pays an annual coupon at 9%.

The bond is bought at a discount of 45 to yield 7.5% annually.

Determine the price of the bond.

Solution:

$$C - P = 45 \Rightarrow P = C - 45$$

$$P = Fra_{\overline{12}|} + Cv^{12}$$

$$= 2500(0.09) \left( \frac{1 - (1.075)^{-12}}{0.075} \right) + (C)(1.075)^{-12}$$

$$= (225)(7.735278275) + (C)(1.075)^{-12} = 1,740.437612 + 0.419854129C$$

$$P = C - 45 = 1740.44 + 0.41985C$$

$$C - 0.41985C = 1740.44 + 45$$

$$0.580145871C = 1785.44$$

$$C = 3077.5667$$

$$P = C - 45 = 3077.5667 - 45 = 3032.5667$$

Points	
1	Proper relationship that $P=C-45$
3	Price formula setup <ul style="list-style-type: none"> <li>• 2 points for proper PV of coupons</li> <li>• 1 point for proper discounting of maturity value <math>C</math></li> </ul>

2. (4 points) You purchase a 20-year callable bond. The bond matures at the end 20 years for its par value of 10,000. The bond pays semi-annual coupons at a rate of 7.5% convertible semi-annually.

The bond is also callable at the end of 12, 15, and 18 years and will include the following schedule of call premiums.

Call Date	Call Premium
12 Years	1,000
15 Years	615
18 Years	250

Calculate the price you should pay to assure a yield rate of 6% convertible semi-annually.

Solution:

$$PMT = 10000 * 3.75\% = 375$$

$$I / Y = 3$$

<i>N</i>	<i>FV</i>	<i>CPT _ PV</i>
24	11,000	11,762.0094
30	10,615	11,723.40496 ←
36	10,250	11723.67704
40	10,000	11733.6079

Select the lowest price (worst case scenario) to secure the desired yield rate.

Points	
2	Correct setup for finding PV
1	Correct handling of call premium
1	Correct selection of lowest price
	*No points deducted for not checking maturity value, but need to check this.

3. (6 points) A 10,000 par-value 10-year bond with  $r\%$  annual coupons and redeemable at par is bought at a premium to yield an annual effective yield rate of 6%.

The interest portion of the 7<sup>th</sup> coupon is 641.81.

Calculate  $r$ .

Solution:

	$C_{pn}$	$I_t$	$P_t$	$B_t$
6	10,000 $r$			<input type="text"/>
7	10,000 $r$	641.81		

$$B_6 = 10,000r a_{\overline{4}|} + 10,000 \left(\frac{1}{1.06}\right)^4$$

$$I_7 = 641.81 = (0.06) \left[ 10,000r a_{\overline{4}|} + 10,000 \left(\frac{1}{1.06}\right)^4 \right]$$

$$641.81 = (0.06) \left[ 34,651.05613r + 7920.936632 \right]$$

$$r = 0.08011$$

Points	
4	Correct setup for book value at time 6
2	Correct equation involving $I(7)$

4. (6 points) You are given the following spot interest rates:

$t$	$r_t$		$t$	$r_t$
0.25	1.00%		1.75	2.05%
0.50	1.10%		2.00	2.40%
0.75	1.22%		2.25	2.75%
1.00	1.35%		2.50	3.05%
1.25	1.50%		2.75	3.30%
1.50	1.75%		3.00	3.50%

The following have the same present value.

- A 2-year bond is redeemable at par that pays semiannual coupons at a rate of 6% convertible semi-annually. The bond has a maturity value of 10,000.
- A 3-year annuity due with 3 annual payments. The first payment is  $P$ , with each subsequent payment being 5% greater than the payment prior.

Calculate  $P$ .

Solution:

$$\text{Coupon} = \left( \frac{0.06}{2} \right) (10,000) = 300$$

$$\text{Price}_a = \left( \frac{300}{1.011^{0.5}} \right) + \left( \frac{300}{1.0135^1} \right) + \left( \frac{300}{1.0175^{1.5}} \right) + \left( \frac{10,300}{1.024^2} \right) = 10,709.507$$

$$\text{Price}_b = P \left[ 1 + 1.05 \left( \frac{1}{1.0135} \right) + (1.05)^2 \left( \frac{1}{1.024} \right)^2 \right]$$

$$10,709.507 = P[3.087439747]$$

$$P = 3,468.734$$

Points	
3	Correct setup for a <ul style="list-style-type: none"> <li>• 1 point for proper coupon</li> <li>• 2 points for rest of the setup</li> </ul>
3	Correct setup for b <ul style="list-style-type: none"> <li>• 1 point for correct setup of increasing payments</li> <li>• 2 points for rest of the setup</li> </ul>

**Additional Rubric Details**

***Math Errors:*** If all setup is correct in any given problem, but numerical answer is incorrect, 4-point problems receive a 0.5-point deduction, 6-point problems receive a 1-point deduction (unless “typo”, then max -0.5)

***Calculation Incomplete:*** If all setup correct but did not compute the final answer, 4-point problems receive a 1-point deduction, 6-point problems receive a 1.5-point deduction