# MA 16200: Second Midterm Examiniation

**Fall 2025, Purdue University**

Exam version: 01

Name: _____ PUID #: _____

**Exam Instructions:**

- Follow these instructions carefully. Failure to do so may result in your exam being invalidated and/or an academic integrity violation. All suspected violations of academic integrity will be reported to the Office of the Dean of Students.
- Mark the circle of your recitation section below. Write your name and PUID on the top of this cover page **AND** the back cover page. **DO NOT WRITE ANYTHING ELSE** on either cover pages.

| | Sec | Time | TA Name |
|---|---|---|---|
| ◯ | 121 | 7:30AM | Jonah Boan |
| ◯ | 109 | 7:30AM | Juliet Raginsky |
| ◯ | 202 | 7:30AM | Dhruv Wadhwa |
| ◯ | 123 | 8:30AM | Jonah Boan |
| ◯ | 111 | 8:30AM | Juliet Raginsky |
| ◯ | 204 | 8:30AM | Dhruv Wadhwa |
| ◯ | 902 | 9:30AM | Luke Miga |
| ◯ | 212 | 9:30AM | Kathryn Moran |
| ◯ | 904 | 10:30AM | Luke Miga |
| ◯ | 210 | 10:30AM | Kathryn Moran |
| ◯ | 115 | 11:30AM | Skip Moses |
| ◯ | 218 | 11:30AM | Uyen Nguyen |
| ◯ | 909 | 11:30AM | Shivang Patel |
| ◯ | 113 | 12:30PM | Skip Moses |
| ◯ | 220 | 12:30PM | Uyen Nguyen |

| | Sec | Time | TA Name |
|---|---|---|---|
| ◯ | 910 | 12:30PM | Shivang Patel |
| ◯ | 117 | 12:30PM | Alex Yang |
| ◯ | 214 | 1:30PM | Fawzan Ali |
| ◯ | 208 | 1:30PM | Oliver Tan |
| ◯ | 119 | 1:30PM | Alex Yang |
| ◯ | 216 | 2:30PM | Fawzan Ali |
| ◯ | 206 | 2:30PM | Oliver Tan |
| ◯ | 224 | 3:30PM | Ayo Aitokhuehi |
| ◯ | 103 | 3:30PM | Trey Crouch |
| ◯ | 107 | 3:30PM | Marissa Munoz |
| ◯ | 906 | 3:30PM | Andy Yu |
| ◯ | 222 | 4:30PM | Ayo Aitokhuehi |
| ◯ | 101 | 4:30PM | Trey Crouch |
| ◯ | 105 | 4:30PM | Marissa Munoz |
| ◯ | 908 | 4:30PM | Andy Yu |

- This exam consists of 12 questions for a total of 100 points.
- You have exactly one hour to complete the exam.
- Do not open the exam booklet or start writing before the proctor signals the start of the exam.
- Additional pages for scratch work can be found at the end of the booklet.
- Calculators, electronic devices, books, or notes are **NOT ALLOWED**.
- Students may not look at anybody else's exam, and may not communicate with anybody else except with their TA or instructor if there is a question.
- If you finish the exam before 8:55 pm, you may leave the room after turning in the exam booklet. You may not leave the room before 8:20 pm. If you don't finish before 8:55 pm, **YOU MUST REMAIN SEATED** until your TA comes and collects your exam booklet. You must stop working when the proctor signals the end of exam.

*Good luck!*

**DO NOT DETACH THIS PAGE FROM THE EXAM BOOKLET.**

**Answer Sheet Instructions:**

- Fill the circles completely with a **#2 PENCIL** for your answer choices. If you need to change your answer choice, erase the mark completely.

**DO:** ○ ●

**DON'T:** ⊘ ⊗ ⊘ ⊘ ◉ ●

- Mark **EXACTLY ONE** circle for each question. Questions with more than one marked circle will receive no credit.
- Only what you marked on this page will be graded for score.
- Partial credit will not be awarded, unless otherwise indicated by individual questions.

**Mark all your answer choices below:**

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| #1 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #2 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #3 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #4 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #5 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #6 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

| | A | B | C | D | E | F | G | H | I | J |
|---|---|---|---|---|---|---|---|---|---|---|
| #7 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #8 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #9 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #10 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #11 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |
| #12 | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ |

Exam booklet version: ● 01 ○ 02 ○ Alternate ○ Enlarged Text

Make no stray marks in the boxed region above. Do not modify the exam booklet version marking.

**Common trigonometric identities:**

$\cos(x)^2 + \sin(x)^2 = 1$ $\quad \sec(x)^2 - \tan(x)^2 = 1$ $\quad \sin(2x) = 2\cos(x)\sin(x)$

$\cos(2x) = \cos(x)^2 - \sin(x)^2$ $\quad \cos(2x) = 2\cos(x)^2 - 1$ $\quad \cos(2x) = 1 - 2\sin(x)^2$

**DO NOT DETACH THIS PAGE FROM THE EXAM BOOKLET.**

**Remember to mark all your answer choices on the second cover page!**

1. (8 points) Perform polynomial long division to obtain polynomials $q(x)$ and $r(x)$ that satisfy

$$\frac{x^3}{x^2+x-3} = q(x) + \frac{r(x)}{x^2+x-3}$$

and that the degree of $r(x)$ is strictly less than 2. What is $r(x)$?

(A) $r(x) = 4x - 3$
(B) $r(x) = 4x + 3$
(C) $r(x) = -4x$
(D) $r(x) = 3$
(E) $r(x) = -4x + 3$

2. (8 points) Evaluate

$$\int_0^\infty \frac{3x^2}{(x^3+1)^3}\,dx.$$

(A) $-2$
(B) $2$
(C) $1/2$
(D) $-1/2$
(E) The integral is divergent.

**Remember to mark all your answer choices on the second cover page!**

3. (12 points) Which of the following statements about the integrals

$$\text{(i)} \int_{-1}^{1} \frac{1}{x^2}\,dx, \quad \text{and} \quad \text{(ii)} \int_{0}^{1} \frac{1}{e^{-x}+e^{x}}\,dx$$

are correct?

(A) (i) is not an improper integral; (ii) is not an improper integral.

(B) (i) is not an improper integral; (ii) is a convergent improper integral.

(C) (i) is not an improper integral; (ii) is a divergent improper integral.

(D) (i) is a convergent improper integral; (ii) is not an improper integral.

(E) (i) is a convergent improper integral; (ii) is a convergent improper integral.

(F) (i) is a convergent improper integral; (ii) is a divergent improper integral.

(G) (i) is a divergent improper integral; (ii) is not an improper integral.

(H) (i) is a divergent improper integral; (ii) is a convergent improper integral.

(I) (i) is a divergent improper integral; (ii) is a divergent improper integral.

Note: Partial credit is possible for this question.

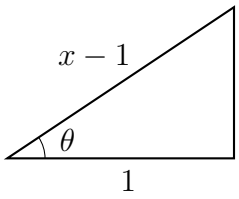
**Remember to mark all your answer choices on the second cover page!**

4. (8 points) Which one of the following triangle is most suitable for setting up a trigonometric substitution on the integral

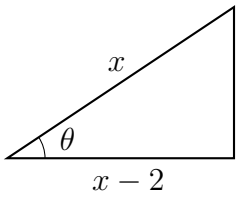
$$\int \sqrt{x(x-2)}\,dx$$

into the variable $\theta$?

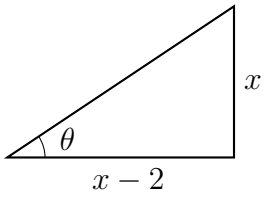
(A)



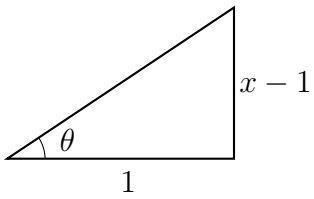

(B)



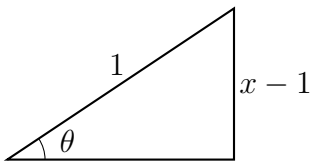

(C)




(D)




(E)



**Remember to mark all your answer choices on the second cover page!**

5. (8 points) Which one of the following is the correct form of the partial fraction decomposition of the rational function

$$\frac{1}{x^5+4x^3+4x} \quad ?$$

(A) $\dfrac{A}{x}+\dfrac{B}{x+2}+\dfrac{C}{(x+2)^2}+\dfrac{D}{x-2}+\dfrac{E}{(x-2)^2}$

(B) $\dfrac{A}{x}+\dfrac{Bx+C}{x^2+2}+\dfrac{Dx+E}{(x^2+2)^2}$

(C) $\dfrac{A}{x}+\dfrac{B}{x+\sqrt{2}}+\dfrac{Cx+D}{(x+\sqrt{2})^2}+\dfrac{E}{x-\sqrt{2}}+\dfrac{Fx+G}{(x-\sqrt{2})^2}$

(D) $\dfrac{A}{x}+\dfrac{B}{x^2+2}+\dfrac{C}{(x^2+2)^2}$

(E) $\dfrac{A}{x}+\dfrac{B}{x+\sqrt{2}}+\dfrac{C}{(x+\sqrt{2})^2}+\dfrac{D}{x-\sqrt{2}}+\dfrac{E}{(x-\sqrt{2})^2}$

6. (8 points) Evaluate

$$\int_0^1 x^3\sqrt{1-x^2}\,dx.$$

(A) 2/15

(B) 0

(C) 1/3

(D) 1/5

(E) The integral is divergent.

**Remember to mark all your answer choices on the second cover page!**

7. (8 points) Evaluate

$$\int_{-1}^{2} \frac{3x-4}{(x-3)(x+2)}\,dx.$$

(A) $\ln(3)+\ln(2)$

(B) $\ln(3)-\ln(2)$

(C) $0$

(D) $\ln(4)$

(E) The integral is divergent.

8. (8 points) Find the value of $A$ if

$$\int_{0}^{\pi/4} x\sec(x)^2\,dx = A - \int_{0}^{\pi/4} \tan(x)\,dx.$$

(A) $A=\sqrt{3}\pi/4$

(B) $A=\pi/4$

(C) $A=1$

(D) $A=\sqrt{2}\pi/2$

(E) $A=\sqrt{2}\pi/4$

**Remember to mark all your answer choices on the second cover page!**

9. (8 points) Evaluate

$$\int xe^x \, dx.$$

(A) $xe^x + e^x + C$

(B) $\dfrac{x^2e^x}{2} + C$

(C) $-xe^x + e^x + C$

(D) $xe^x - e^x + C$

(E) $-xe^x - e^x + C$

10. (8 points) Evaluate

$$\int_0^1 \frac{1}{x^2 - x} \, dx.$$

(A) 2

(B) 0

(C) $-1$

(D) 1

(E) The integral is divergent.

**Remember to mark all your answer choices on the second cover page!**

11. (8 points) Evaluate

$$\int_0^1 \frac{1}{(x^2+1)^2}\,dx.$$

(A) $\frac{\pi}{8}+\frac{1}{2}$

(B) $\frac{\pi}{4}+\frac{1}{2}$

(C) $\frac{\pi}{8}+\frac{1}{4}$

(D) $\frac{\pi}{8}$

(E) $\frac{\pi}{4}$

12. (8 points) Evaluate

$$\int_0^{\pi/2} \cos(x)^3\,dx.$$

(A) $-2/3$

(B) $2/3$

(C) $1/4$

(D) $-1/4$

(E) $0$

**Remember to mark all your answer choices on the second cover page!**
**DO NOT DETACH THIS PAGE FROM THE EXAM BOOKLET.**
This page is left blank intentionally for scratch work.

**Remember to mark all your answer choices on the second cover page!**
**DO NOT DETACH THIS PAGE FROM THE EXAM BOOKLET.**
This page is left blank intentionally for scratch work.

**Remember to mark all your answer choices on the second cover page!**
**DO NOT DETACH THIS PAGE FROM THE EXAM BOOKLET.**
Write down your name and PUID on this page.

Name: _____ PUID #: _____

Do not write anything else on this page.

Do not write anything else on this page.

Do not write anything else on this page.