

**MATH 152, FALL 2021**  
**COMMON EXAM II - VERSION A**

LAST NAME(print): \_\_\_\_\_ FIRST NAME(print): \_\_\_\_\_

INSTRUCTOR: \_\_\_\_\_

SECTION NUMBER: \_\_\_\_\_

**DIRECTIONS:**

1. The use of a calculator, laptop or computer is prohibited.
2. **TURN OFF** cell phones and put them away. If a cell phone is seen during the exam, your exam will be collected and you will receive a zero.
3. In Part 1 (Problems 1-15), mark the correct choice on your ScanTron using a No. 2 pencil. The scantrons will not be returned, therefore *for your own records, also record your choices on your exam!*
4. In Part 2 (Problems 16-19), present your solutions in the space provided. *Show all your work* neatly and concisely and *clearly indicate your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.
5. Be sure to *write your name, section number and version letter of the exam on the ScanTron form*.
6. **Again. The use of a calculator, laptop or computer is prohibited.**

THE AGGIE HONOR CODE

**“An Aggie does not lie, cheat, or steal, or tolerate those who do.”**

Signature: \_\_\_\_\_

**FOR INSTRUCTOR USE ONLY**

Question	Points Awarded	Points
1-15	ScanTron	60
16		12
17		12
18		8
19		8
<b>TOTAL</b>		100

Part 1: Multiple Choice (4 points each)

1. Which statement is true about the integral  $\int_0^4 \frac{2}{(x-3)^2} dx$ ?

- (a) Diverges
- (b) Converges to  $\frac{8}{3}$
- (c) Converges to  $\frac{4}{3}$
- (d) Converges to  $-\frac{8}{3}$
- (e) Converges to  $-\frac{4}{3}$

2. Which sequence is both bounded and increasing?

- (a)  $a_n = 1 - \frac{2}{n}$
- (b)  $a_n = \ln n$
- (c)  $a_n = \sin(2n\pi)$
- (d)  $a_n = e^{-n}$
- (e) None of these

3. The integral  $\int_0^\infty e^{-2x} dx$

- (a) diverges
- (b) converges to 0
- (c) converges to  $\frac{1}{4}$
- (d) converges to  $\frac{1}{2}$
- (e) converges to 2

4. Which of the following integrals is equivalent to  $\int \sqrt{4x^2 - 9} dx$ ?

(a)  $2 \int \sec \theta \tan^2 \theta d\theta$

(b)  $\frac{9}{2} \int \tan \theta d\theta$

(c)  $\frac{9}{2} \int \sec \theta \tan^2 \theta d\theta$

(d)  $\frac{9}{2} \int \sec^2 \theta \tan \theta d\theta$

(e)  $2 \int \sec^2 \theta \tan \theta d\theta$

5. After an appropriate substitution, the integral  $\int \sqrt{9 - x^2} dx$  is equivalent to which of the following?

(a)  $9 \int \sec \theta \tan^2 \theta d\theta$

(b)  $3 \int \cos \theta d\theta$

(c)  $9 \int \sec^3 \theta d\theta$

(d)  $9 \int \cos^2 \theta d\theta$

(e)  $3 \int \tan \theta d\theta$

6. Determine whether the following series converges or diverges. If it converges, find the sum.

$$\sum_{n=1}^{\infty} \left( \frac{3}{n} - \frac{3}{n+1} \right)$$

(a) Diverges

(b) Converges to 0

(c) Converges to 1

(d) Converges to  $\frac{3}{2}$

(e) Converges to 3

7. Evaluate  $\int_0^1 \frac{4x^2 + 5}{2x + 1} dx$

- (a)  $2 \ln 3$
- (b)  $3 \ln 3$
- (c)  $4 \ln 3$
- (d)  $6 \ln 3$
- (e) None of these

8. Write out the form of the partial fraction decomposition of the function

$$f(x) = \frac{x^3 - 2x^2 - 5x + 4}{(x + 2)^2(x^2 - 1)(x^2 + 5x + 7)}$$

- (a)  $\frac{A}{x + 2} + \frac{B}{(x + 2)^2} + \frac{C}{x - 1} + \frac{D}{x + 1} + \frac{Ex + F}{x^2 + 5x + 7}$
- (b)  $\frac{A}{x + 2} + \frac{B}{(x + 2)^2} + \frac{Cx + D}{x^2 - 1} + \frac{Ex + F}{x^2 + 5x + 7}$
- (c)  $\frac{A}{(x + 2)^2} + \frac{B}{x - 1} + \frac{C}{x + 1} + \frac{Dx + E}{x^2 + 5x + 7}$
- (d)  $\frac{A}{(x + 2)^2} + \frac{B}{x^2 - 1} + \frac{Cx + D}{x^2 + 5x + 7}$
- (e)  $\frac{Ax + B}{(x + 2)^2} + \frac{Cx + D}{x^2 - 1} + \frac{Ex + F}{x^2 + 5x + 7}$

9. The recursive sequence given below is bounded and increasing. Determine whether the sequence converges or diverges. If it converges, find the limit of the sequence.

$$a_1 = 4, \quad a_{n+1} = 8 - \frac{15}{a_n}$$

- (a) The sequence diverges.
- (b) 3
- (c) 4
- (d) 5
- (e) 8

10. Which statement is true about the integral  $\int_1^{\infty} \frac{3 \sin^2 x}{x^2} dx$ ?

- (a) The integral converges by comparison to  $\int_1^{\infty} \frac{1}{x} dx$
- (b) The integral diverges by comparison to  $\int_1^{\infty} \frac{3}{x^2} dx$
- (c) The integral converges by comparison to  $\int_1^{\infty} \frac{3}{x^2} dx$
- (d) The integral diverges by comparison to  $\int_1^{\infty} \frac{1}{x} dx$
- (e) None of these

11. Consider the series  $\sum_{n=1}^{\infty} a_n$  whose  $n$ -th partial sum is given by  $s_n = \frac{2}{3 - e^{-2n}}$ . What is  $\sum_{n=1}^{\infty} a_n$ ?

- (a) 0
- (b) 1
- (c)  $\frac{1}{3}$
- (d)  $\frac{2}{3}$
- (e) 2

12. Which of the following integrals is equivalent to  $\int \frac{1}{(x^2 - 4x + 5)^{3/2}} dx$ ?

- (a)  $\frac{1}{9} \int \cos \theta d\theta$
- (b)  $\int \cos^3 \theta d\theta$
- (c)  $\frac{1}{27} \int \cos^3 \theta d\theta$
- (d)  $\int \sec \theta d\theta$
- (e)  $\int \cos \theta d\theta$

13. Use the Remainder Estimate for the Integral Test to determine the minimum number of terms needed to approximate the sum of the series  $\sum_{n=1}^{\infty} \frac{1}{n^3}$  to within  $\frac{1}{80}$ .

- (a) 4 terms
- (b) 5 terms
- (c) 6 terms
- (d) 7 terms
- (e) 8 terms

14. The integral  $\int_0^1 \ln x \, dx$

- (a) diverges
- (b) converges to 0
- (c) converges to  $e$
- (d) converges to 1
- (e) converges to  $-1$

15. Which of the following sequences converges?

(i)  $a_n = \cos\left(\frac{1}{n}\right)$

(ii)  $a_n = \frac{(-1)^n 3n}{n+1}$

(iii)  $a_n = \ln(n^2 + 1) - \ln n$

- (a) Only (i) converges
- (b) Only (ii) converges
- (c) Only (i) and (iii) converge
- (d) Only (i) and (ii) converge
- (e) All three sequences diverge

Part 2: Work Out

**Directions:** Present your solutions in the space provided. *Show all your work* neatly and concisely and *box your final answer*. You will be graded not merely on the final answer, but also on the quality and correctness of the work leading up to it.

16. (12 pts) Evaluate  $\int \frac{-2x + 4}{(x^2 + 1)(x - 1)} dx$

17. (12 pts) Evaluate  $\int \frac{1}{x^2\sqrt{x^2+4}} dx$ .

18. (8 pts) Consider the following series

$$\sum_{n=1}^{\infty} \frac{3^{n-1} + 1}{3^{2n}}$$

- (a) Determine whether the series converges or diverges, and state the reason.
- (b) If it converges, find its sum. If it diverges, write DIVERGES.

19. (8 pts) Use the Integral Test to determine whether  $\sum_{n=2}^{\infty} \frac{1}{n(\ln n)^2}$  converges or diverges. Support your answer.