

**MATH 152, FALL 2010
COMMON EXAM II - VERSION B**

LAST NAME, First name (print): _____

INSTRUCTOR: _____

SECTION NUMBER: _____

UIN: _____

SEAT NUMBER: _____

DIRECTIONS:

1. The use of a calculator, laptop, or computer is prohibited.
2. In Part 1 (Problems 1-10), mark the correct choice on your ScanTron using a No. 2 pencil. *For your own records, also record your choices on your exam, as Scantrons will NOT be returned!*
3. In Part 2 (Problems 11-15), 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.
4. Be sure to *write your name, section and version letter of the exam on the ScanTron form.*

THE AGGIE CODE OF HONOR

"An Aggie does not lie, cheat, or steal, or tolerate those who do."

Signature: _____

1. The sequence $a_n = \frac{1}{5 - e^{-n}}$

- (a) converges to $\frac{1}{5}$.
- (b) converges to $\frac{1}{4}$.
- (c) converges to 5.
- (d) diverges.
- (e) converges to 0.

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

- (a) The integral diverges by oscillation.
- (b) The integral converges by comparison to $\int_1^{\infty} \frac{1}{x^2} dx$.
- (c) The integral converges to 0.
- (d) The integral diverges by comparison to $\int_1^{\infty} \frac{1}{x} dx$.
- (e) The integral diverges by comparison to $\int_1^{\infty} 1^2 dx$.

3. The sequence $a_n = \frac{(-1)^n(2n^2 + 2)}{3n^2 + 1}$

- (a) converges to $\frac{2}{3}$.
- (b) converges to $-\frac{2}{3}$.
- (c) converges to 2.
- (d) converges to 0.
- (e) diverges.

4. Which statement is true about the series $\sum_{n=2}^{\infty} \frac{n}{n^3 - 5}$?

(a) The series is divergent because $\frac{n}{n^3 - 5} > \frac{1}{n}$ and $\sum_{n=2}^{\infty} \frac{1}{n}$ is divergent.

(b) The series is convergent because $\frac{n}{n^3 - 5} < \frac{1}{n^2}$ and $\sum_{n=2}^{\infty} \frac{1}{n^2}$ is convergent.

(c) The series is convergent because $\lim_{n \rightarrow \infty} \frac{n}{n^3 - 5} = 0$.

(d) The series is convergent because $\lim_{n \rightarrow \infty} \frac{\frac{n}{n^3 - 5}}{\frac{1}{n^2}} = 1$ and $\sum_{n=2}^{\infty} \frac{1}{n^2}$ is convergent.

(e) The series is divergent because $\lim_{n \rightarrow \infty} \frac{n}{n^3 - 5} \neq 0$.

5. Which of the following series is convergent?

(a) $\sum_{n=1}^{\infty} \frac{1}{n}$

(b) $\sum_{n=2}^{\infty} \frac{1}{n \ln n}$

(c) $\sum_{n=1}^{\infty} \frac{1}{\sqrt[3]{n}}$

(d) $\sum_{n=1}^{\infty} \frac{1}{n^{3/2}}$

(e) More than one of these series is convergent.

6. Which of the following is the form of the partial fraction decomposition of $\frac{x+3}{(x+1)^2(x^2+2x+3)}$?

- (a) $\frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{C}{x^2+2x+3}$
- (b) $\frac{Ax+B}{(x+1)^2} + \frac{C}{x+3} + \frac{D}{x-1}$
- (c) $\frac{A}{x+3} + \frac{B}{x+1} + \frac{C}{(x+1)^2} + \frac{D}{x-1} + \frac{E}{x+3}$
- (d) $\frac{A}{x+1} + \frac{Bx+C}{(x+1)^2} + \frac{D}{x^2+2x+3}$
- (e) $\frac{A}{x+1} + \frac{B}{(x+1)^2} + \frac{Cx+D}{x^2+2x+3}$

7. Compute $\int_{-1}^3 \frac{1}{x^2} dx$.

- (a) $\frac{4}{3}$
- (b) $\ln 9$
- (c) $-\frac{4}{3}$
- (d) $\frac{2}{3}$
- (e) The integral diverges

8. Which of the following integrals gives the area of the surface obtained by rotating the curve $y = e^{2x}$, $0 \leq x \leq 1$ about the x -axis?

- (a) $\int_0^1 2\pi x \sqrt{1+4e^{4x}} dx$
- (b) $\int_0^1 2\pi x \sqrt{1+\frac{1}{4}e^{4x}} dx$
- (c) $\int_0^1 2\pi e^{2x} \sqrt{1+4e^{4x}} dx$
- (d) $\int_0^1 2\pi \sqrt{1+2e^{2x}} dx$
- (e) $\int_0^1 2\pi e^{2x} \sqrt{1+\frac{1}{4}e^{4x}} dx$

9. The n th partial sum of a series $\sum_{n=1}^{\infty} a_n$ is given by $s_n = \frac{2n-1}{n+1}$. Which of the following statements is true?

- I. The series $\sum_{n=1}^{\infty} a_n$ converges to 2
- II. The series $\sum_{n=1}^{\infty} a_n$ diverges by the Test for Divergence
- III. The sequence a_n converges to 0

- (a) only I and III are true
- (b) only I is true
- (c) only II and III are true
- (d) only II is true
- (e) all three statements are true

10. After an appropriate substitution, the integral $\int_{\sqrt{3}}^2 \sqrt{4-x^2} dx$ is equivalent to which of the following?

- (a) $4 \int_{\pi/6}^{\pi/2} \sec \theta \tan^2 \theta d\theta$
- (b) $4 \int_{\pi/3}^{\pi/2} \cos^2 \theta d\theta$
- (c) $2 \int_{\pi/3}^{\pi/2} \cos \theta d\theta$
- (d) $4 \int_{\pi/6}^{\pi/2} \cos^2 \theta d\theta$
- (e) $2 \int_{\pi/6}^{\pi/2} \tan \theta d\theta$

PART II 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.

11. (10 points) Compute $\int \frac{dx}{x^2\sqrt{x^2-4}}$

12. (8 points each) Find the sum of the following series or show they are divergent:

$$(a) \sum_{n=0}^{\infty} \frac{2 + 2^n}{10^n}$$

$$(b) \sum_{n=0}^{\infty} \frac{2}{(n+1)(n+3)}$$

13. (6 points each) Given the curve parametrized by
 $x = \cos t + t \sin t$, $y = \sin t - t \cos t$, $0 \leq t \leq \frac{\pi}{2}$:

(a) Find the length of the curve.

(b) SET UP, BUT DO NOT EVALUATE, an integral to find the area of the surface formed by rotating the curve about the y -axis.

14. (10 points) Compute $\int \frac{3x^2 - 4x + 11}{(x - 1)(x^2 + 4)} dx$

15. (6 points each) Given the series $\sum_{n=1}^{\infty} 3n^2 e^{-n^3}$:

(a) Show using the Integral Test that the series is convergent.

(b) According to Matlab, the third partial sum $s_3 \approx 1.107663875$. Use the remainder theorem to estimate the largest possible error.

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-10		40
11		10
12		16
13		12
14		10
15		12
TOTAL		100