MATH 152 Spring 2016
COMMON EXAM II - VERSION A

LAST NAME: ______________________________ FIRST NAME: ________________________

INSTRUCTOR: ______________________________

SECTION NUMBER: ____________

UIN: ______________________________

DIRECTIONS:

1. The use of a calculator, laptop or cell phone 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 ScanTron will not be returned, therefore *for your own records, also record your choices on your exam!* Each problem is worth 4 points.
4. In Part 2 (Problems 16-20), 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.*

THE AGGIE CODE OF HONOR

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

Signature: ____

DO NOT WRITE BELOW!

Question	Points Awarded	Points
1-15		45
16		5
17		8
18		12
19		10
20		9
21		11
Total		100

PART I: Multiple Choice. 3 points each.

1. Which of the following is the correct partial fraction decomposition for $f(x) = \dfrac{4x+3}{x^2(x^2-9)(x^2+4)}$?

   (a) $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x+3} + \dfrac{D}{x-3} + \dfrac{Ex+F}{x^2+4}$

   (b) $\dfrac{A}{x^2} + \dfrac{B}{x+3} + \dfrac{C}{x-3} + \dfrac{Dx+E}{x^2+4}$

   (c) $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{Cx}{x^2-9} + \dfrac{Ex}{x^2+4}$

   (d) $\dfrac{A}{x^2} + \dfrac{Bx+C}{x^2-9} + \dfrac{Dx+E}{x^2+4}$

   (e) $\dfrac{A}{x} + \dfrac{B}{x^2} + \dfrac{C}{x+3} + \dfrac{D}{x-3} + \dfrac{E}{x+2} + \dfrac{F}{(x+2)^2}$

2. Find the length of the curve $y = \sqrt[3]{x^2}$, $0 \le y \le 1$.

   (a) $\dfrac{2}{3}\left(\left(\dfrac{5}{3}\right)^{3/2} - 1\right)$

   (b) $\dfrac{8}{27}\left(\left(\dfrac{13}{4}\right)^{3/2} - 1\right)$

   (c) $\dfrac{2}{3}\left(\left(\dfrac{13}{4}\right)^{3/2} - 1\right)$

   (d) $\dfrac{4}{9}\left(\left(\dfrac{5}{3}\right)^{3/2} - 1\right)$

   (e) $\dfrac{3}{2}\left(\left(\dfrac{13}{4}\right)^{3/2} - 1\right)$

3. The integral $\displaystyle\int_{-1}^{2} \frac{dx}{x^3}$

   (a) converges to $\dfrac{3}{8}$

   (b) converges to $\dfrac{7}{32}$

   (c) converges to $\dfrac{3}{4}$

   (d) diverges

   (e) converges to $\dfrac{3}{2}$

4. Which of the following integrals results after performing an appropriate trigonometric substitution for $\displaystyle\int_0^{1/2} x^2\sqrt{1+4x^2}\,dx$?

   (a) $8\displaystyle\int_0^{\pi/4} \tan^2\theta\sec^3\theta\,d\theta$

   (b) $\dfrac{1}{4}\displaystyle\int_0^{\pi/2} \sin^2\theta\cos^2\theta\,d\theta$

   (c) $\dfrac{1}{8}\displaystyle\int_0^{\pi/4} \tan^2\theta\sec^3\theta\,d\theta$

   (d) $\dfrac{1}{8}\displaystyle\int_0^{\pi/4} \tan^2\theta\sec\theta\,d\theta$

   (e) $4\displaystyle\int_0^{\pi/2} \sin^2\theta\cos^2\theta\,d\theta$

5. Compute $\displaystyle\int_2^3 \frac{x^3}{x-1}\,dx$.

   (a) $\dfrac{5}{2}+\ln 2$

   (b) $\dfrac{59}{6}-\ln 2$

   (c) $\dfrac{29}{6}+\ln 2$

   (d) $\dfrac{29}{6}-\ln 2$

   (e) $\dfrac{59}{6}+\ln 2$

6. The sequence $a_n = 2\ln(7n+3)-\ln(5n^2+1)$

   (a) converges to $\ln\left(\dfrac{49}{5}\right)$

   (b) converges to $\ln\left(\dfrac{7}{25}\right)$

   (c) converges to $\ln\left(\dfrac{7}{5}\right)$

   (d) converges to $\ln\left(\dfrac{5}{49}\right)$

   (e) diverges

7. $\displaystyle\sum_{n=0}^{\infty} \frac{2^{2n}}{5^{n+1}} =$

(a) $\frac{1}{3}$

(b) 4

(c) $\frac{4}{3}$

(d) 1

(e) $\frac{1}{9}$

8. The integral $\displaystyle\int_1^{\infty} \frac{dx}{\sqrt{x} + e^{9x}}$

(a) converges by comparison with $\displaystyle\int_1^{\infty} \frac{1}{\sqrt{x}}\, dx$

(b) diverges by comparison with $\displaystyle\int_1^{\infty} \frac{1}{e^{9x}}\, dx$

(c) diverges by comparison with $\displaystyle\int_1^{\infty} \frac{1}{\sqrt{x}}\, dx$

(d) converges by comparison with $\displaystyle\int_1^{\infty} \frac{1}{e^{9x}}\, dx$

(e) converges to 0

9. If the *nth* partial sum of the series $\displaystyle\sum_{n=1}^{\infty} a_n$ is $s_n = \dfrac{2n+3}{n+5}$, find a_3 as well as the sum, S, of the series $\displaystyle\sum_{n=1}^{\infty} a_n$.

(a) $a_3 = \frac{1}{8}$ and the series diverges.

(b) $a_3 = \frac{1}{8}$ and $S = 2$.

(c) $a_3 = \frac{9}{8}$ and $S = 1$.

(d) $a_3 = \frac{9}{8}$ and the series diverges.

(e) $a_3 = \frac{71}{24}$ and $S = 2$.

10. Which of the following integrals gives the surface area obtained by rotating the curve $y = \sin\left(\frac{x}{2}\right)$, $0 \le x \le \frac{\pi}{2}$ about the y axis?

(a) $\displaystyle\int_0^{\sqrt{2}/2} 2\pi y\sqrt{1+\frac{4}{1-y^2}}\,dy$

(b) $\displaystyle\int_0^{\sqrt{2}/2} 4\pi \arcsin y\sqrt{1+\frac{4}{1-y^2}}\,dy$

(c) $\displaystyle\int_0^{1} 4\pi \arcsin y\sqrt{1+\frac{4}{1-y^2}}\,dy$

(d) $\displaystyle\int_0^{1} 2\pi y\sqrt{1+\frac{4}{1-y^2}}\,dy$

(e) $\displaystyle\int_0^{\sqrt{2}/2} 2\pi \arcsin y\sqrt{1+\frac{4}{1-y^2}}\,dy$

11. Given the sequence $a_1 = 1$ and $a_{n+1} = \sqrt{12 + a_n}$ is increasing and bounded, what statement is true about a_n?

(a) converges to 4

(b) converges to 3

(c) converges to 2

(d) converges to 6

(e) diverges

12. Find s_4, the fourth partial sum, of the series $\sum\limits_{n=1}^{\infty} \cos\left(\frac{n\pi}{3}\right)$.

(a) $s_4 = -\frac{3}{2}$

(b) $s_4 = -\frac{1}{2}$

(c) $s_4 = -1 - \frac{\sqrt{3}}{2}$

(d) $s_4 = \frac{1}{2}$

(e) $s_4 = -\frac{\sqrt{3}}{2}$

13. After making an appropriate trigonometric substitution, which of the following integrals is equivalent to $\int \sqrt{-x^2+2x+3}\,dx$?

(a) $4\int \sec\theta \tan^2\theta \, d\theta$

(b) $2\int \cos\theta \, d\theta$

(c) $4\int \sec^3\theta \, d\theta$

(d) $4\int \cos^2\theta \, d\theta$

(e) $2\int \sec\theta \, d\theta$

14. Find the length of the curve $x = \frac{t^2}{2}$, $y = \frac{t^3}{3}$, $0 \le t \le 1$.

(a) $\frac{4}{3}\left(2^{3/2}-1\right)$

(b) $\frac{1}{54}\left(10^{3/2}-1\right)$

(c) $3(2^{3/2}-1)$

(d) $\frac{1}{24}\left(10^{3/2}-1\right)$

(e) $\frac{1}{3}\left(2^{3/2}-1\right)$

15. Given the sequence $a_n = \frac{\ln n}{n}$, $n \ge 5$, which of the following statements are true?

I. a_n is decreasing II. $(-1)^n a_n$ converges to 0 III. a_n is bounded

(a) only I. and II.

(b) only II. and III.

(c) only I. and III.

(d) only II.

(e) All of the above statements are true.

PART II: Work Out

16. Consider the sequence $a_n = \dfrac{3n}{5n+4}$.

    a.) (2 pts) Find the limit of a_n.

    b.) (3 pts) Find the sum of the series $\sum_{n=1}^{\infty} a_n$ or explain why it diverges.

17. (8 pts) Compute $\displaystyle\int_e^{\infty} \frac{\ln x}{x^2}\,dx$ or show that it diverges.

18. a.) (4 pts) Find the partial fraction decomposition for $\dfrac{-2}{(2n+1)(2n-1)}$.

b.) (4 pts) Find a formula for s_n, the nth partial sum of the series $\sum_{n=1}^{\infty} \dfrac{-2}{(2n+1)(2n-1)}$.

c.) (4 pts) Find $\sum_{n=1}^{\infty} \dfrac{-2}{(2n+1)(2n-1)}$.

19. Consider the surface obtained by rotating the curve $y = \ln(2x+5)$, $1 \leq x \leq 2$, about the x-axis.

a.) (5 pts) Set up but do not evaluate an integral in terms of x that gives the area of the surface.

b.) (5 pts) Set up but do not evaluate an integral in terms of y that gives the area of the surface.

20. (9 pts) Find $\displaystyle\int \frac{1}{x^4\sqrt{x^2-4}}\,dx$. Express your answer without the use of trig or inverse trig functions.

21. (11 pts) Find $\int \frac{5x^2+7x+8}{(x-1)(x^2+9)}\,dx$