

MATH 152, FALL 2021
COMMON EXAM I - 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		8
17		11
18		9
19		12
TOTAL		100

Part 1: Multiple Choice (4 points each)

1. Evaluate $\int_{\sqrt{2}}^2 \frac{4x}{x^2 - 1} dx$

- (a) $2 \ln 3$
- (b) $2 \ln 2 - 2 \ln \sqrt{2}$
- (c) $\ln 3 - 1$
- (d) $2 \ln 3 - 2$
- (e) $2 \ln 2$

2. Which of the following gives the volume of the solid found by rotating the region bounded by the curves $y = 7 - x^2$ and $y = 3$ about the line $y = 0$?

- (a) $\int_3^7 2\pi x(7 - x^2) dx$
- (b) $\int_{-2}^2 \pi[(7 - x^2) - 3] dx$
- (c) $\int_{-2}^2 \pi(4 - x^2)^2 dx$
- (d) $\int_{-2}^2 \pi[(7 - x^2)^2 - 9] dx$
- (e) $\int_3^7 2\pi y \sqrt{4 - y} dy$

3. A 20 ft rope weighing 0.1 lb/ft is hanging down the side of a 20 ft building. There is a 5 lb bucket attached to the rope. How much work is required to pull the rope with the bucket 2 ft up the side of the building?

- (a) $6.8 \text{ ft} - \text{lb}$
- (b) $13.8 \text{ ft} - \text{lb}$
- (c) $14 \text{ ft} - \text{lb}$
- (d) $14.2 \text{ ft} - \text{lb}$
- (e) $120 \text{ ft} - \text{lb}$

4. Evaluate $\int \sin^2(x) dx$.

(a) $\frac{1}{2}x - \frac{1}{4}\sin(2x) + C$

(b) $\frac{1}{3}\sin x \cos x + C$

(c) $\frac{1}{2}x + \frac{1}{2}\sin x + C$

(d) $\frac{1}{2}x - \frac{1}{4}\sin x + C$

(e) $\frac{1}{3}\cos^3 x + C$

5. Calculate the area of the region bounded by the curves $4x + y^2 = 12$ and $x = y$.

(a) 21

(b) $\frac{62}{3}$

(c) $\frac{64}{3}$

(d) 22

(e) $\frac{73}{3}$

6. Compute $\int_1^e (\ln x)^2 dx$.

(a) 1

(b) $\frac{1}{e} - 1$

(c) $\frac{2}{e} - 2$

(d) $e - 1$

(e) $e - 2$

7. Find the volume of the solid found by rotating the region bounded by the curves $y = -x^2 + 2x$ and $y = 0$ about the y -axis.

- (a) $\frac{16}{3}\pi$
- (b) $\frac{8}{3}\pi$
- (c) $\frac{4}{3}\pi$
- (d) $\frac{2}{3}\pi$
- (e) $\frac{1}{3}\pi$

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

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

9. Evaluate $\int \frac{1+x}{1+x^2} \, dx$.

- (a) $\frac{1}{2} \ln(1+x^2) + C$
- (b) $\frac{3}{2} \ln(1+x^2) + C$
- (c) $\ln(1+x^2) + C$
- (d) $\frac{1}{2} \ln(1+x^2) + \arctan x + C$
- (e) $\arctan x + \arcsin(x^2) + C$

10. Which of the following represents the area bounded by the curves $y = x^2 - 4$ and $y = -x^2 - 2x$ on the interval $-3 \leq x \leq 1$.

- (a) $\int_{-2}^1 (-2x^2 - 2x + 4) dx$
(b) $\int_{-3}^{-2} (-2x^2 - 2x + 4) dx + \int_{-2}^1 (2x^2 + 2x - 4) dx$
(c) $\int_{-3}^{-2} (2x^2 + 2x - 4) dx + \int_{-2}^1 (-2x^2 - 2x + 4) dx$
(d) $\int_{-3}^1 (-2x^2 - 2x + 4) dx$
(e) $\int_{-3}^1 (2x^2 + 2x - 4) dx$

11. Evaluate $\int x^3 \sqrt{x^2 + 1} dx$.

- (a) $\frac{1}{5}(x^2 + 1)^{\frac{5}{2}} - \frac{1}{3}(x^2 + 1)^{\frac{3}{2}} + C$
(b) $\frac{1}{3}(x^2 + 1)^{\frac{3}{2}} + C$
(c) $3x^2 \sqrt{x^2 + 1} + \frac{x^4}{\sqrt{x^2 + 1}} + C$
(d) $\frac{2}{5}(x^2 + 1)^2 - \frac{2}{3}(x^2 + 1) + C$
(e) None of these

12. If f is continuous and $\int_0^{16} f(x) dx = 8$, find $\int_0^4 xf(x^2) dx$.

- (a) 16
(b) 2
(c) 8
(d) 64
(e) 4

13. A spring has a natural length of 2 m . If a force of 12 N is required to hold the spring to a length of 4 m , find the work done to stretch the spring from 3 m to 5 m .

- (a) 24 J
- (b) 27 J
- (c) 30 J
- (d) 12 J
- (e) 6 J

14. Compute $\int_0^1 (x^2 + 3)e^{-x} dx$.

- (a) $-\frac{8}{e}$
- (b) $\frac{2}{e} - 1$
- (c) $\frac{2}{e} + 1$
- (d) $-\frac{2}{e} + 5$
- (e) $-\frac{8}{e} + 5$

15. Evaluate $\int \tan^3(x) \sec^5(x) dx$.

- (a) $\frac{1}{7} \tan^7 x - \frac{1}{5} \sec^5 x + C$
- (b) $\frac{1}{7} \sec^7 x - \frac{1}{5} \tan^5 x + C$
- (c) $\frac{1}{4} \sec^6 x - \frac{1}{6} \tan^{10} x + C$
- (d) $\frac{1}{4} \sec^4 x - \frac{1}{6} \tan^6 x + C$
- (e) $\frac{1}{7} \sec^7 x - \frac{1}{5} \sec^5 x + C$

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. (8 pts) Compute $\int \sin^7 \theta \cos^5 \theta \, d\theta$.

17. (11 pts) The base of a solid is the region bounded by the curve $y = 5 - x^2$ and the x -axis. Cross-Sections perpendicular to the y -axis are rectangles with height equal to twice the base. Find the volume of this solid.

18. (9 pts) Consider the region R bounded by $y = x^3$, $y = -x + 2$, $x = 0$, and $x = 1$.

(a) (3 pts) Sketch the region R .

(b) (3 pts) Set up the integral that gives the volume obtained by revolving the region R about the x -axis using the method of washers. **DO NOT EVALUATE THE INTEGRAL.**

(c) (3 pts) Set up the integral that gives the volume obtained by revolving the region R about the line $x = 1$ using the method of cylindrical shells. **DO NOT EVALUATE THE INTEGRAL.**

19. (12 pts) A spherical tank with radius 5 m is half full of a liquid that has a density of 1000 kg/m^3 . The tank has a 1 m spout at the top. Set up an integral to find the work required to pump all the water out of the spout. (Use 9.8 m/s^2 for g .)

Note 1. Do NOT evaluate your integral.

Note 2. Clearly indicate in the picture below where you are placing your axis and which direction is positive.

