

MATH 152, Fall 2022
COMMON EXAM I - VERSION **B**

LAST NAME(print): _____ FIRST NAME(print): _____

UIN: _____

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, 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, 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 fill in your name, UIN, 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: _____

This page intentionally left blank.

PART I: Multiple Choice. 4 points each

1. Which of the following represents the area bounded by the curves $y = x^2 - 2x$ and $y = 2x$ on the interval from $x = 1$ to $x = 6$?

(a) $\int_0^6 4x - x^2 dx$

(b) $\int_0^4 4x - x^2 dx$

(c) $\int_1^4 4x - x^2 dx + \int_4^6 x^2 - 4x dx$

(d) $\int_1^4 x^2 - 4x dx + \int_4^6 4x - x^2 dx$

(e) $\int_1^6 4x - x^2 dx$

2. The region bounded by the curves $y = x^2$ and $y = 1$ is rotated about the line $y = 1$. Find the volume of the resulting solid.

(a) $\frac{16\pi}{15}$

(b) $\frac{8\pi}{5}$

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

(d) $\frac{12\pi}{5}$

(e) $\frac{8\pi}{15}$

3. Compute $\int \cos^3(2x) dx$

(a) $-\sin(2x) + \frac{1}{3} \sin^3(2x) + C$

(b) $\frac{1}{2} \sin(2x) - \frac{1}{6} \sin^3(2x) + C$

(c) $\frac{-1}{2} \sin(2x) + \frac{1}{6} \cos^3(2x) + C$

(d) $\sin(2x) - \frac{1}{3} \sin^3(2x) + C$

(e) None of these.

4. Compute $\int x^3 \sqrt{2+x^4} dx$

- (a) $\frac{3}{8} (2+x^4)^{3/2} + C$
- (b) $\frac{1}{6} (2+x^4)^{3/2} + C$
- (c) $\frac{8}{3} (2+x^4)^{3/2} + C$
- (d) None of these
- (e) $\frac{1}{4} (2+x^4)^{3/2} + C$

5. Find the area bounded by $y = e^x$, $y = e^{-x}$, $x = 0$, and $x = 1$.

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

6. Compute $\int \tan^3(x) \sec^3(x) dx$

- (a) $-\frac{1}{5} \sec^5(x) + \frac{1}{3} \sec^3(x) + C$
- (b) $\frac{1}{5} \tan^5(x) - \frac{1}{3} \tan^3(x) + C$
- (c) $-\frac{1}{5} \tan^5(x) + \frac{1}{3} \tan^3(x) + C$
- (d) $\frac{1}{5} \sec^5(x) - \frac{1}{3} \sec^3(x) + C$
- (e) $-\sec^4(x) + \sec^2(x) + C$

7. Consider the region bounded by the curves $y = x^3$, $y = 8$, and the y -axis. Which of the following represents the volume of this region being rotated about the x -axis?

(a) $\int_0^8 \pi y^{2/3} dy$

(b) $\int_0^2 \pi(64 - x^6) dx$

(c) None of these.

(d) $\int_0^2 \pi(8 - x^3)^2 dx$

(e) $\int_0^2 \pi(8 - x^3) dx$

8. Suppose the **work** required to stretch a spring from its natural length to 4 m beyond its natural length is 16J. How much **force** is needed to hold the spring stretched 6 m beyond its natural length?

- (a) 12 N
(b) 24 N
(c) 72 N
(d) 36 N
(e) 18 N

9. Compute $\int_0^1 x^3(x^2 - 1)^4 dx$

- (a) $-\frac{1}{60}$
(b) $\frac{1}{30}$
(c) $-\frac{1}{30}$
(d) $\frac{1}{15}$
(e) $\frac{1}{60}$

10. Which of the following represents the volume of the region bounded by the curves $y = 6x - x^2$ and the x -axis being rotated about $x = -1$.

(a) $\int_0^6 2\pi(x-1)(6x-x^2)dx$

(b) $\int_0^6 \pi((6x-x^2)^2 - 1^2) dx$

(c) $\int_0^6 2\pi x(6x-x^2)dx$

(d) $\int_0^6 2\pi(1-x)(6x-x^2)dx$

(e) $\int_0^6 2\pi(x+1)(6x-x^2)dx$

11. Compute $\int x^3 \sin(x) dx$

(a) $C - x^3 \cos(x) - 3x^2 \sin(x) + 6x \cos(x) + 6 \sin(x)$

(b) $C + x^3 \cos(x) + 3x^2 \sin(x) - 6x \cos(x) + 6 \sin(x)$

(c) $C + x^3 \cos(x) + 3x^2 \cos(x) - 6x \sin(x) + 6 \cos(x)$

(d) $C + \frac{1}{4}x^4 - \frac{1}{3}x^3 \sin(x) + \frac{1}{6}x^2 \cos(x) + \frac{1}{6}x \sin(x)$

(e) $C - x^3 \cos(x) + 3x^2 \sin(x) + 6x \cos(x) - 6 \sin(x)$

12. Compute $\int \cos^4(x) \sin^5(x) dx$

(a) None of these.

(b) $\frac{1}{6} \sin^6(x) - \frac{1}{10} \sin^{10}(x) + C$

(c) $-\frac{1}{5} \cos^5(x) + \frac{2}{7} \cos^7(x) - \frac{1}{9} \cos^9(x) + C$

(d) $-\frac{1}{5} \cos^5(x) + \frac{1}{9} \cos^9(x) + C$

(e) $\frac{1}{6} \sin^6(x) - \frac{1}{4} \sin^8(x) + \frac{1}{10} \sin^{10}(x) + C$

13. Compute $\int_0^{\pi/4} \sec^4(x) dx$

(a) $\frac{2}{3}$

(b) $\frac{32}{5}$

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

(d) $\frac{4\sqrt{2}}{5}$

(e) $\frac{2\sqrt{2}-1}{3}$

14. A cable, 20 feet long and weighing 6 pounds per foot, is hanging off the side of a 30 foot tall building. At the bottom of the cable is a bucket of rocks weighing 100 pounds. How much work is required to pull 10 feet of the cable to the top of the building?

(a) 1900 ft-lbs

(b) 300 ft-lbs

(c) 900 ft-lbs

(d) 1300 ft-lbs

(e) 3200 ft-lbs

15. Compute $\int_1^e x^2 \ln x dx$.

(a) $\frac{2}{9}e^3 - \frac{1}{9}$

(b) $1 - e$

(c) $\frac{2}{9}e^3 + \frac{1}{9}$

(d) $e^2 - \frac{1}{9}e^3 + \frac{1}{9}$

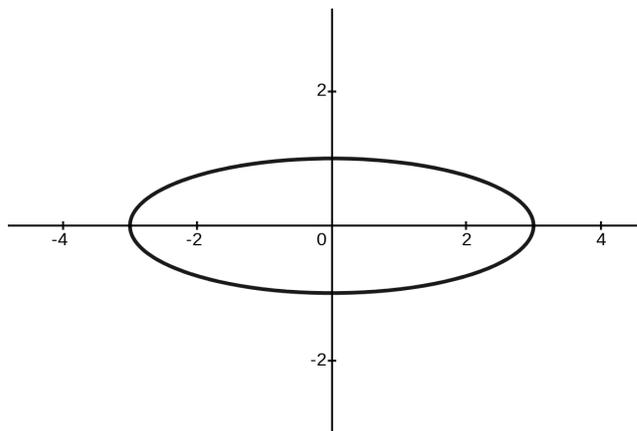
(e) None of these.

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.

16. (6 points) Compute $\int \cos^2(x) \sin^2(x) dx$

17. (8 points) Find the volume of the solid whose base is the ellipse $x^2 + 9y^2 = 9$ and whose cross-sections perpendicular to the y -axis are squares. Evaluate your integral.



18. Consider the region bounded by the curves $y = 5x - x^2$ and $y = 5 - x$

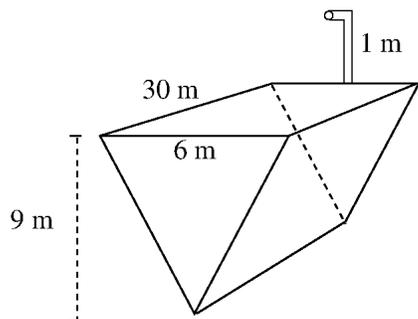
(a) (8 points) **Set up** an integral to find the volume of the solid formed by rotating this region about the line $y = -3$. **Do not evaluate your integral.**

(b) (8 points) **Set up** an integral to find the volume of the solid formed by rotating this region about the line $x = 8$. **Do not evaluate your integral.**

19. (10 points) A tank filled with water is in the shape of a trough with isosceles triangles at its ends. The trough is 30 meters long, has a height of 9 meters, and the width of the trough across the top is 6 meters. The trough has a spout with height 1 meter. The weight density of water is $\rho g = 9800N/m^3$.

Set up an integral that will compute the work required to pump all the water out of the spout. **Do not evaluate!**

Clearly indicate on the picture where you are placing the axis and which direction is positive.



DO NOT WRITE IN THIS TABLE.

Question	Points Awarded	Points
1-15		60
16		6
17		8
18		16
19		10
		100