MATH 2414 EXAM II
SUMMER 2020 EGLEY

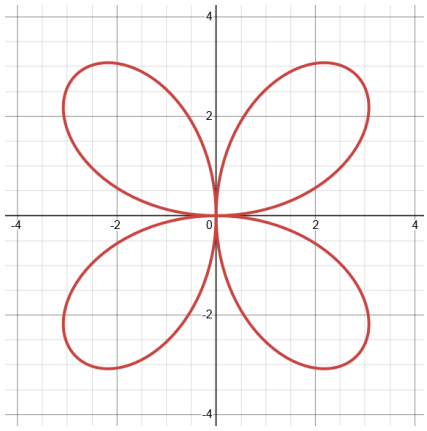
WRITE THE CORRECT RESPONSE IN THE BLANK SPACE ON YOUR ANSWER SHEET.
FOR THE MULTIPLE CHOICE, **USE ONLY CAPITAL LETTERS**. FOR THE ITEMS INDICATED AS SHORT ANSWER, WRITE YOUR RESULT IN THE BLANK SPACE.

YOU MAY USE A CALCULATOR, YOUR NOTES, AND THE TEXTBOOK.

YOU MUST SUBMIT A PIC OF ALL YOUR ANSWER SHEETS NO LATER THAN TODAY AT 12:15pm.

I. MULTIPLE CHOICE: WRITE YOUR RESPONSE IN THE SPACE ON THE ANSWER SHEET.
USE ONLY CAPITAL LETTERS.

1. WHICH OF THE FOLLOWING INTEGRALS WILL DETERMINE THE AREA CONTAINED IN **TWO** OF THE PETALS OF THE ROSE CURVE $r = 4\sin(2\theta)$



A. ALL OF B, C, AND D ARE CORRECT

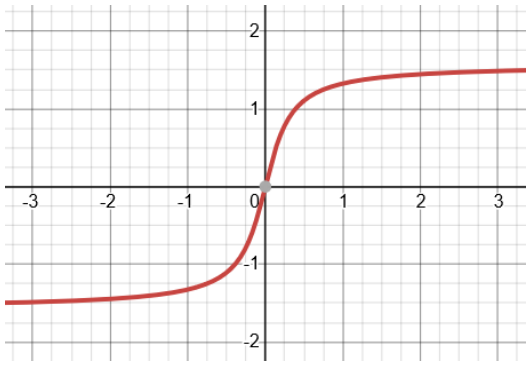
B. $\int_0^{\pi/2} [4\sin(2\theta)]^2 \, d\theta$

C. $2\int_0^{\pi/4} [4\sin(2\theta)]^2 \, d\theta$

D. $2\int_{\pi/4}^{\pi/2} [4\sin(2\theta)]^2 \, d\theta$

E. NONE OF THESE

2. WHICH OF THE FOLLOWING INTEGRALS WILL DETERMINE THE ARC LENGTH OF THE CURVE $f(x) = \tan^{-1}(4x)$ ON THE INTERVAL $-1 \le x \le 2$



A. $\int_{-1}^{2} \sqrt{1+[\tan^{-1}(4x)]} \, dx$

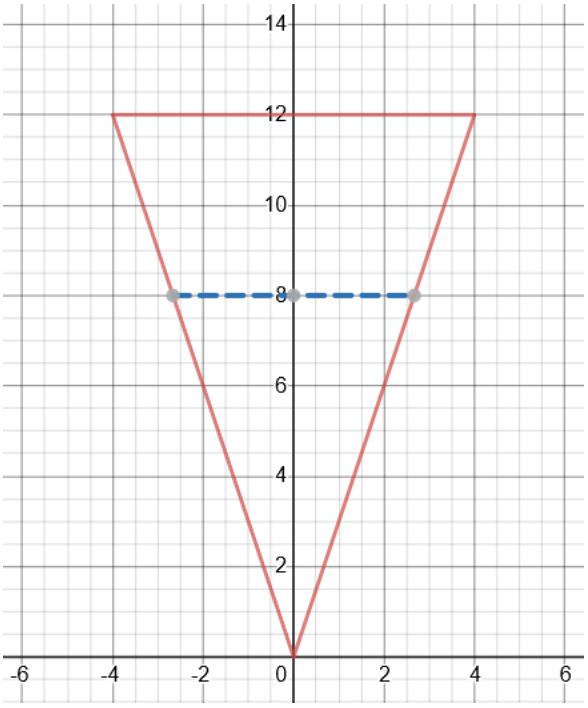
B. $\int_{-1}^{2} \sqrt{1+[\tan^{-1}(4x)]^2} \, dx$

C. $\int_{-1}^{2} \sqrt{1+[\sec^{-1}(4x)]^2} \, dx$

D. $\int_{-1}^{2} \sqrt{1+[4\sec^{-1}(4x)]^2} \, dx$

E. NONE OF THESE

3. A TANK IS IN THE SHAPE OF AN INVERTED CIRCULAR CONE. THE HEIGHT OF THE CONE IS 12 FEET AND THE RADIUS AT THE TOP IS 4 FEET. ASSUME THE TANK IS FILLED TO A DEPTH OF 8 FEET WITH A LIQUID THAT HAS A DENSITY CONSTANT OF ρ. WHICH OF THE FOLLOWING INTEGRALS WILL DETERMINE THE WORK DONE EMPTYING THE LIQUID OVER THE TOP OF THE TANK?



A. $\rho\pi\int_0^{12}[3x]^2[12-y]\,dy$

B. $2\rho\pi\int_0^{8}[\frac{1}{3}y]^2[12-y]\,dy$

C. $\rho\pi\int_0^{8}[\frac{1}{3}y]^2[12-y]\,dy$

D. $\rho\pi\int_0^{8}[3y]^2[12-y]\,dy$

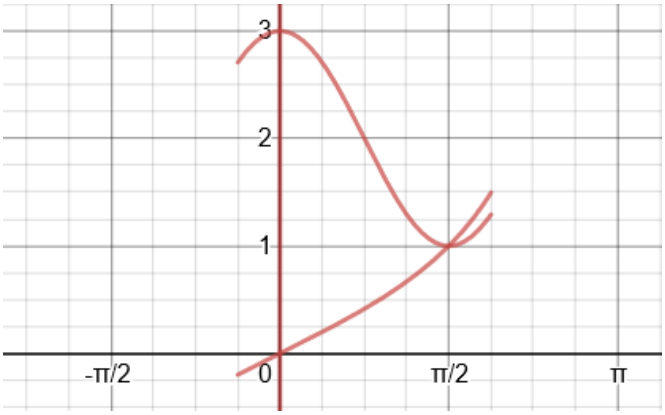
E. NONE OF THESE

4. IF A FORCE OF 4 NEWTONS COMPRESSES A SPRING ½ OF A METER, WHICH OF THE FOLLOWING IS THE FORCE FUNCTION CORRESPONDING TO THE SPRING?

A. $F(x)=\frac{1}{2}x$ B. $F(x)=8x$ C. $F(x)=4x$ D. $F(x)=2x$

E. NONE OF THESE

5. FOR A PLANAR LAMINA WITH DENSITY CONSTANT ρ AND BOUNDED BY THE GRAPHS OF $y = \tan(\frac{1}{2}x)$, $y = 2 + \cos(2x)$, AND THE y-AXIS, WHICH OF THESE WILL DETERMINE THE VALUE OF $\overline{x}$?



A. $$\overline{x} = \frac{\rho \int_0^{\pi/2} [x]\left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}{\int_0^{\pi/2} \left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}$$

B. $$\overline{x} = \frac{\int_0^{\pi/2} [x]\left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}{\int_0^{\pi/2} \left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}$$

C. $$\overline{x} = \frac{\int_0^{\pi/2} \left[\frac{(2+\cos(2x)) + (\tan(\frac{1}{2}x))}{2}\right]\left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}{\int_0^{\pi/2} \left[(2+\cos(2x)) - (\tan(\frac{1}{2}x))\right] dx}$$

D. NOT ENOUGH INFORMATION IS GIVEN
E. NONE OF THESE

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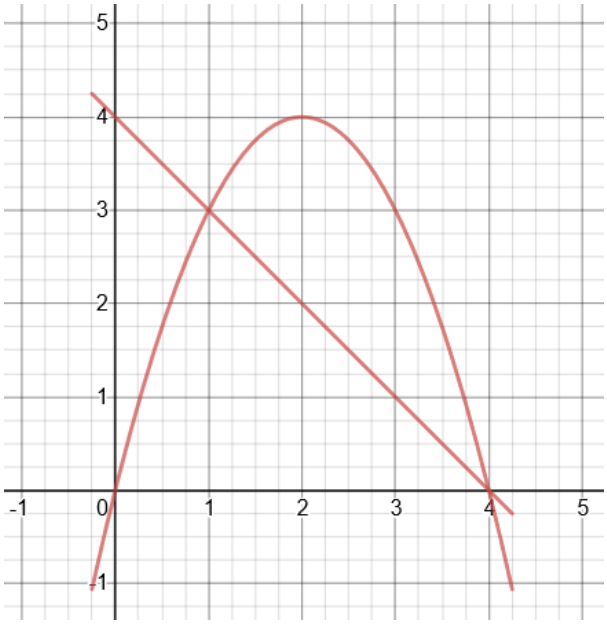
EACH OF ITEMS #6 THRU #10 REFERENCES THE REGION BOUNDED BY THE GRAPHS OF

$y = 4x - x^2$ AND

$y = 4 - x$



6. CONSIDER THE SOLID OF REVOLUTION OBTAINED BY ROTATING THE REGION ABOUT THE x-AXIS. TO FIND THE VOLUME OF THE SOLID **USING THE WASHER METHOD**, WHICH AXIS WOULD BE PARTITIONED?

A. THE x-AXIS B. THE y-AXIS C. EITHER AXIS
D. NOT ENOUGH INFORMATION IS GIVEN E. NONE OF THESE

7. CONSIDER THE SOLID OF REVOLUTION OBTAINED BY ROTATING THE REGION ABOUT THE y-AXIS. TO FIND THE VOLUME OF THE SOLID **USING THE SHELL METHOD**, WHAT WOULD BE THE LIMITS OF INTEGRATION?

A. $y = 0 \; to \; y = 4$ B. $y = 0 \; to \; y = 3$ C. $x = 0 \; to \; x = 4$ D. $x = 1 \; to \; x = 4$
E. NONE OF THESE

8. SUPPOSE THE REGION BOUNDED BY THE TWO CURVES IS A PLANAR LAMINA WITH DENSITY CONSTANT OF ρ. WHICH OF THESE INTEGRALS WILL DETERMINE THE MOMENT OF THE REGION ABOUT THE y-AXIS (THAT IS, M_y)?

A. $\rho \int \left[\dfrac{(4x - x^2) + (4 - x)}{2} \right] \left[(4x - x^2) - (4 - x) \right] dx$

B. $\rho \int_0^4 [x] \left[(4x - x^2) - (4 - x) \right] dx$

C. $\rho \int_1^4 \left[\dfrac{(4x - x^2) + (4 - x)}{2} \right] \left[(4x - x^2) - (4 - x) \right] dx$

D. $\rho \int_1^4 [x] \left[(4x - x^2) - (4 - x) \right] dx$

E. NONE OF THESE

9. WHICH OF THE FOLLOWING INTEGRALS WILL COMPUTE THE ARC LENGTH OF THE PARABOLA BETWEEN THE TWO POINTS WHERE IT INTERSECTS THE LINE?

A. $\pi\int_0^4 \sqrt{1-[4-2x]^2}\ dx$

B. $\int_1^4 \sqrt{1+[4x-x^2]^2}\ dx$

C. $\int_1^4 \sqrt{1+[4-2x]^2}\ dx$

D. $\int_1^4 \sqrt{1+[4-2x]}\ dx$

E. NONE OF THESE

10. CONSIDER THE SOLID OF REVOLUTION OBTAINED BY ROTATING THE REGION ABOUT THE y-AXIS. **USING THE SHELL METHOD**, WHICH OF THESE INTEGRALS WILL FIND THE VOLUME OF THE SOLID?

A. $\pi\int_1^4 x[(4-x)-(4x-x^2)]\,dx$

B. $2\pi\int_1^4 x[(4-x)-(4x-x^2)]\,dx$

C. $\pi\int_1^4 x[(4x-x^2)-(4-x)]\,dx$

D. $\int_1^4 x[(4x-x^2)-(4-x)]\,dx$

E. NONE OF THESE

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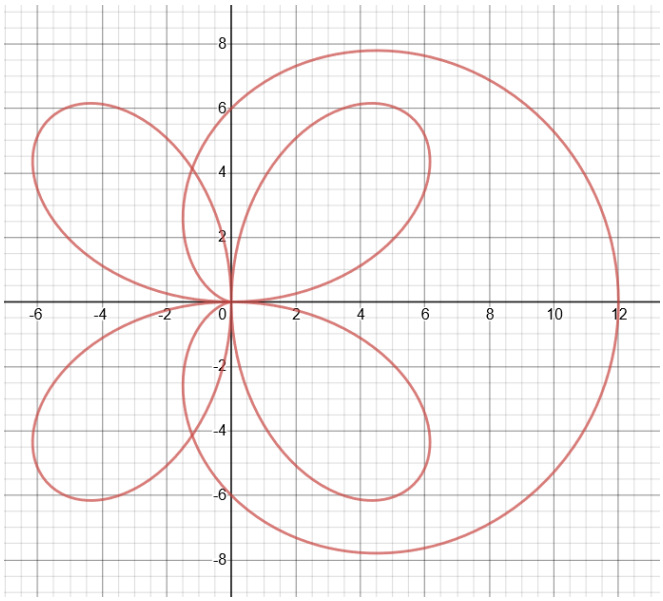
II. SHORT ANSWER. FOR ALL THE REMAINING ITEMS, YOU NEED ONLY **SET UP** AN INTEGRAL THAT DETERMINES THE QUANTITY REQUIRED.

11. SET UP AN INTEGRAL WHICH WILL FIND THE AREA **IN THE FIRST QUADRANT** WHICH LIES **INSIDE** THE CARDIOID $r=6+6\cos(\theta)$ AND **OUTSIDE** THE ROSE CURVE $r=8\sin(2\theta)$.

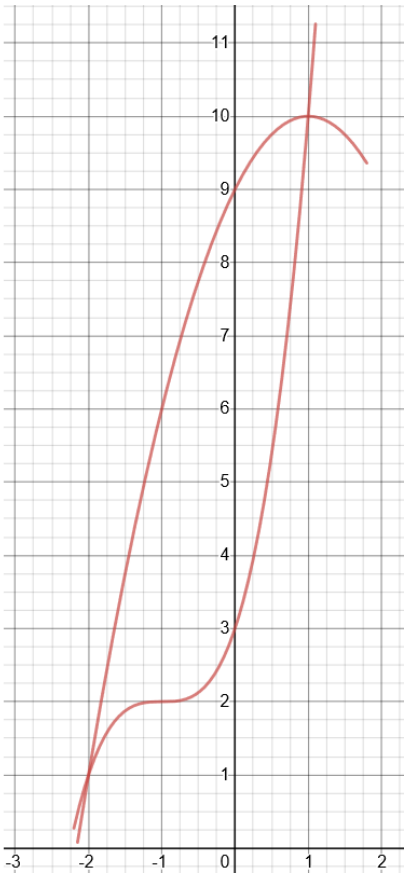


ITEMS 12, 13 AND 14 REFERENCE THE REGION BOUNDED BY THE GRAPHS OF

$y = 10 - (x-1)^2$ (THE TOP CURVE) AND

$y = 2 + (x+1)^3$ (THE BOTTOM CURVE).

THE POINTS OF INTERSECTION ARE $(-2,1)$ AND $(1,10)$



12. A PLANAR LAMINA WITH DENSITY CONSTANT ρ IS BOUNDED BY THE TWO GRAPHS. DETERMINE THE INTEGRALS THAT WILL FIND THE VALUES OF $\bar{x}$ AND $\bar{y}$.

CONSIDER THE SOLID OF REVOLUTION FORMED BY ROTATING THE REGION ABOUT THE x-AXIS. SET UP INTEGRALS THAT WILL DETERMINE THE VOLUME OF THE SOLID USING:

13. THE DISK/WASHER METHOD

14. THE SHELL METHOD

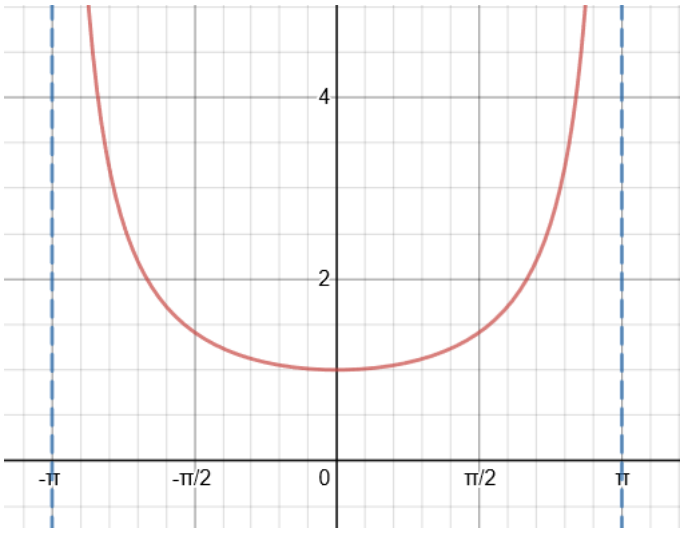
* * * *

15. SET UP AN INTEGRAL WHICH WILL DETERMINE THE ARC LENGTH OF THE CURVE

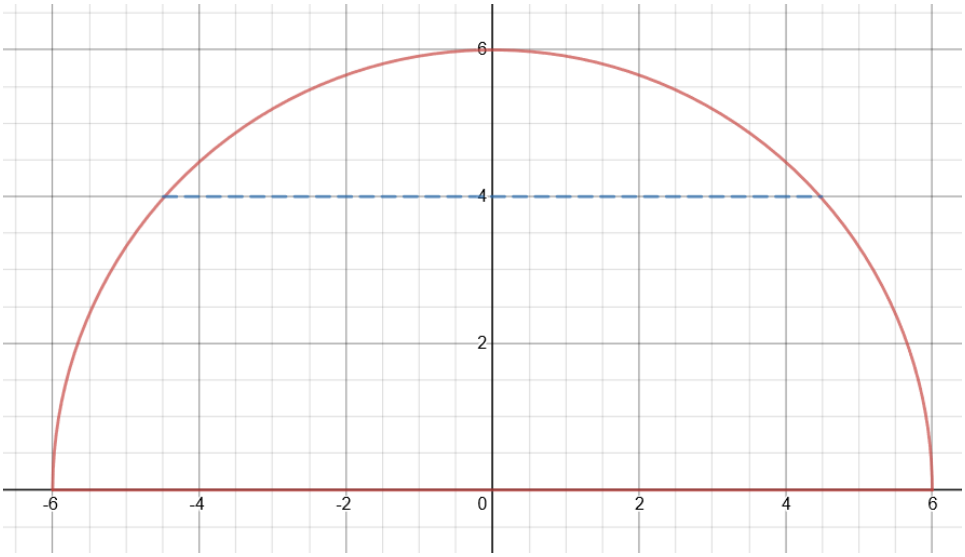
$y = \sec(\frac{1}{2}x)$

ON THE INTERVAL

$-\pi/2 \le x \le 3\pi/4$



16. A TANK IS THE SHAPE OF A HEMISPHERE. FROM THE SIDE IT LOOKS LIKE A SEMI-CIRCLE (AS PICTURED). THE DIAMETER IF THE TANK IS 6ft. THE LIQUID IS 4ft DEEP AND HAS A DENSITY GIVEN BY ρ.
SET UP AN INTEGRAL WHICH WILL DETERMINE THE WORK DONE EMPTYING THE TANK THROUGH A HOLE IN THE VERY TOP OF THE TANK.



17. THE REGION BOUNDED BY THE GRAPHS OF

$y = 3 - x + e^{(x-2)}$ AND

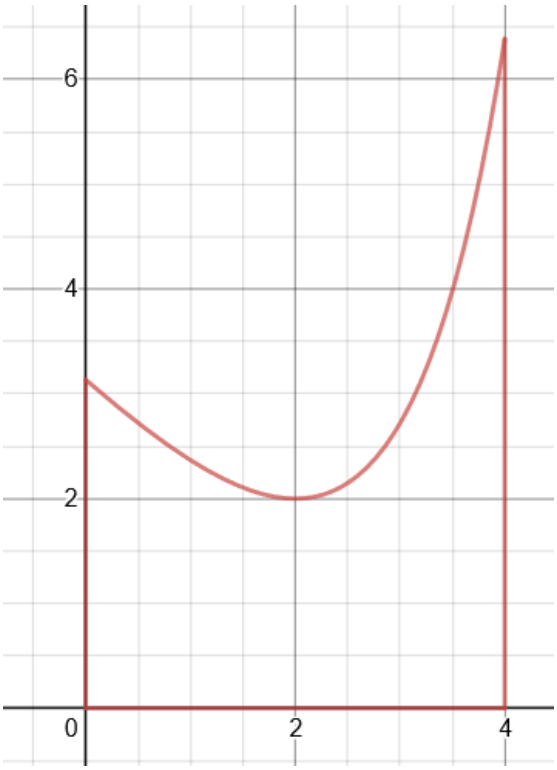
$x = 4$ AND

THE x-AXIS AND

THE y-AXIS

IS ROTATED ABOUT THE y-AXIS, FORMING A SOLID OF REVOLUTION.

SET UP AN INTEGRAL THAT WILL DETERMINE THE VOLUME OF THE SOLID. I AM NOT SPECIFYING WHICH METHOD (DISK/WASHER OR SHELLS) YOU ARE TO USE.



WHEN YOU ARE FINISHED, **PRINT NEATLY** THE FOLLOWING STATEMENT AT THE BOTTOM OF ONE OF YOUR ANSWER SHEETS THEN **SIGN YOUR NAME**:

ON MY HONOR, I HAVE NEITHER GIVEN NOR RECEIVED IMPROPER ASSISTANCE ON THIS EXAM.