MATH 16020 PRACTICE EXAM 2 FRI., JULY 7, 2023

Please show **all** your work! Answers without supporting work will not be given credit. Write answers in spaces provided.

Name:_____

1. Determine if the following integral is proper or improper.

$$\int_0^{\pi/2} \frac{\sin x}{1-\cos x}\,dx$$

(A) It is improper because of a discontinuity at $x = \pi/6$
(B) It is improper because of a discontinuity at $x = \pi/4$
(C) It is improper because of a discontinuity at $x = \pi/3$
(D) It is improper because of a discontinuity at $x = 0$
(E) It is improper because of a discontinuity at $x = \pi/2$
(F) It is proper since it is defined on the interval $[0, \pi/2]$.

2. Determine if the following integral is proper or improper.

$$\int_0^{\pi/2} \tan(x)\,dx$$

(A) It is improper because of a discontinuity at $x = \pi/6$
(B) It is improper because of a discontinuity at $x = \pi/4$
(C) It is improper because of a discontinuity at $x = \pi/3$
(D) It is improper because of a discontinuity at $x = 0$
(E) It is improper because of a discontinuity at $x = \pi/2$
(F) It is proper since it is defined on the interval $[0, \pi/2]$.

3. Determine if the following integral is proper or improper.

$$\int_0^{\pi/2} \cos(x)\,dx$$

(A) It is improper because of a discontinuity at $x = \pi/6$
(B) It is improper because of a discontinuity at $x = \pi/4$
(C) It is improper because of a discontinuity at $x = \pi/3$
(D) It is improper because of a discontinuity at $x = 0$
(E) It is improper because of a discontinuity at $x = \pi/2$
(F) It is proper since it is defined on the interval $[0, \pi/2]$.

4. Evaluate the following integral;

$$\int_1^\infty \frac{5}{\sqrt{x}} dx$$

$$\int_1^\infty \frac{5}{\sqrt{x}} dx \quad = \quad \underline{\qquad\qquad\qquad\qquad}$$

5. Evaluate the following integral;

$$\int_1^\infty \frac{3}{x^2} dx$$

$$\int_1^\infty \frac{3}{x^2} dx \quad = \quad \underline{\qquad\qquad\qquad\qquad}$$

6. Evaluate the following integral;

$$\int_1^\infty \frac{10}{x} dx$$

$$\int_1^\infty \frac{10}{x} dx \quad = \quad \underline{\qquad\qquad\qquad\qquad}$$

7. Evaluate the following integral;

$$\int_0^\infty 7e^{-\frac{1}{3}x}dx$$

$$\int_0^\infty 7e^{-\frac{1}{3}x}dx \quad = \quad \underline{\qquad\qquad\qquad\qquad}$$

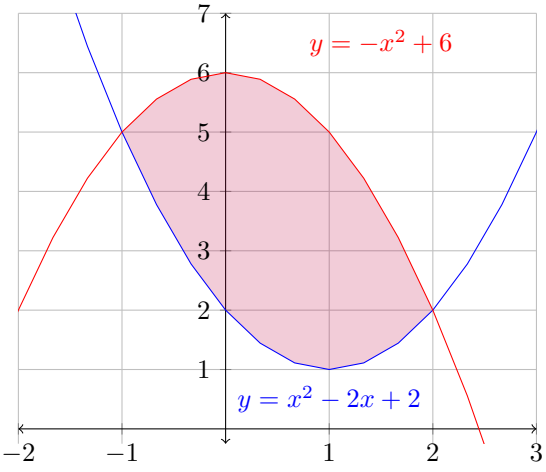
8. Evaluate the definite integral

$$\int_2^\infty \frac{dx}{5x+2}$$

$$\int_2^\infty \frac{dx}{5x+2} = \underline{\qquad\qquad\qquad\qquad}$$

9. Set up the integral that computes the **AREA** shown to the right with respect to x.

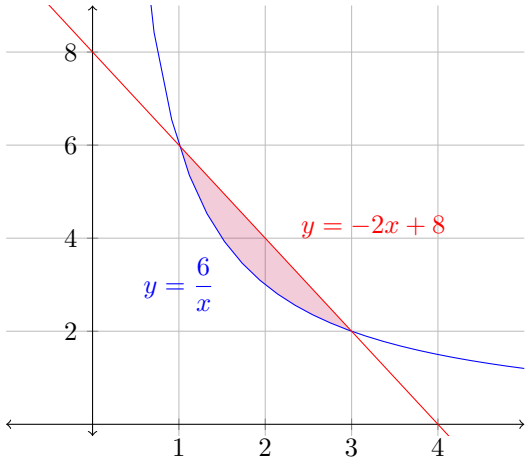
DON'T COMPUTE IT!!!



Area $=$ $\underline{\qquad\qquad\qquad\qquad}$

10. Set up the integral that computes the **AREA** shown to the right with respect to y.

DON'T COMPUTE IT!!!



Area = _____

11. Set up the integral that computes the **AREA** with respect to x of the region bounded by

$$y = \frac{2}{x} \quad \text{and} \quad y = -x + 3$$

Area = _____

12. Find the area of the region bounded by $y = 6x^2$ and $y = 12x$.

Area = _____

13. Find the area of the region bounded by $y = 6x - x^2$ and $y = 2x^2$.

Area = _____

14. Calculate the **AREA** of the region bounded by the following curves.

$$x = 100 - y^2 \quad \text{and} \quad x = 2y^2 - 8$$

Area = _____

15. After t hours studying, one student is working $Q_1(t) = 25 + 9t - t^2$ problems per hour, and a second student is working on $Q_2(t) = 5 - t + t^2$ problems per hour. How many more problems will the first student have done than the second student after 10 hours?

Answer: _____

16. Set up the integral that computes the **VOLUME** of the region bounded by

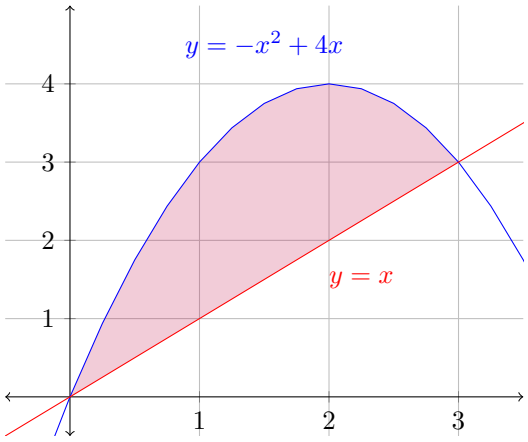
$$y = x + 8, \quad \text{and} \quad y = (x-4)^2$$

about the x-axis

Volume = _____

17. Let R be the region shown below. Set up the integral that computes the **VOLUME** as R is rotated around the x-axis.

DON'T COMPUTE IT!!!



Volume = _____

18. Set up the integral that computes the **VOLUME** of the region bounded by

$$y = \sqrt{16 - x}, \quad y = 0 \quad \text{and} \quad x = 0$$

about the y-axis

Volume = _____

19. Set up the integral that computes the **VOLUME** of the region bounded by

$$y = e^{-x}, \quad y = 4 \quad x = 0 \quad \text{and} \quad x = 10$$

about the x-axis

Volume = _____

20. Find the **VOLUME** of the region bounded by

$$y = 7x, \quad y = 0 \quad x = 1 \quad \text{and} \quad x = 3$$

around the x-axis

Volume = _____

21. Find the **VOLUME** of the region bounded by

$$y = 7x, \quad y = 21 \quad x = 1 \quad \text{and} \quad x = 3$$

around the x-axis

Volume = _____

22. Find the **VOLUME** of the region bounded by

$$y = x - x^2, \quad \text{and} \quad y = 0$$

around the x-axis

Volume = _____

23. Find the **VOLUME** of the solid generate by revolving the given region about the x-axis:

$$y = 8\sqrt{x}, \quad y = 0, \quad x = 3, \quad x = 6$$

Volume = _____

24. Find the **VOLUME** of the solid generated by rotating the region bounded by

$$y = x + 3, \quad x = 0, \quad y = 9$$

around the y-axis

Volume = _____

25. Find the **VOLUME** of the region bounded by

$$y = 10x, \quad x = 0, \quad y = 10$$

around the y-axis

Volume = _____

26. Find the **VOLUME** of the region bounded by

$$x + 3y = 9, \quad x = 0, \quad y = 0$$

around the y-axis

Volume = _____

27. Find the **VOLUME** of the region bounded by

$$y = 4x^2, \quad x = 0, \quad y = 4$$

around the y-axis.

Volume = _____

28. Let R be the region shown to the right. Set up the integral that computes the **VOLUME** as R is rotated around the line $x = 4$.

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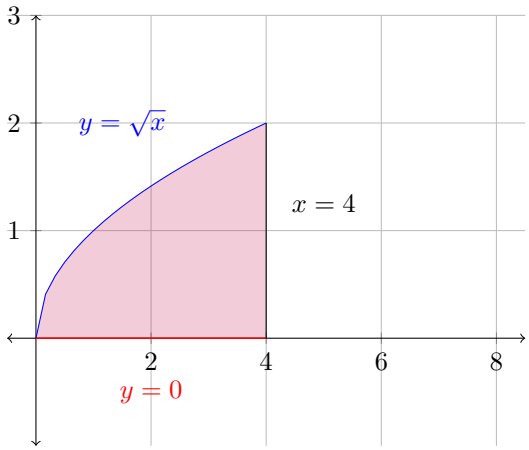

Volume = _____

29. Set up the integral needed to find the volume of the solid obtained when the region bounded by

$$y = 2 - x^2 \quad \text{and} \quad y = x^2$$

is rotated about the line $y = 3$.

Volume = _____

30. Find the **VOLUME** of the region bounded by

$$y = 3x^2, \quad x = 0, \quad y = 27$$

around the line $y = 27$

Volume = _____

31. Find the **VOLUME** of the region bounded by

$$y = 3x, \quad x = 0, \quad y = 27$$

around the line $y = 27$

Volume = _____

32. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$x = 2y - y^2, \quad \text{and} \quad x = 0$$

about the x-axis.

Volume = _____

33. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$y = \sqrt{x}, \quad \text{and} \quad y = x$$

about the y-axis.

Volume = _____

34. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$y = 2 - x^2, \quad \text{and} \quad y = x^2$$

about the y-axis.

Volume = _____

35. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$y = x, \quad \text{and } y = x^2$$

about the line $x = -2$.

Volume = _____

36. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$y = 7x^2, \quad y = 0 \text{ and } \quad x = 2$$

about the line $x = 3$.

Volume = _____

37. Using the **Shell Method**, set up the integral that computes the **VOLUME** of the region bounded by

$$x = y^2 + 1, \text{ and } \quad x = 2$$

about the line $y = -2$.

Volume = _____