

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

Name: _____

1. Evaluate the definite integral.

$$\int_0^{\pi/2} (x - 1) \sin(x) dx$$

$$\int_0^{\pi/2} (x - 1) \sin(x) dx = \underline{\hspace{4cm}}$$

2. Evaluate

$$\int 3x \ln(x^7) dx$$

$$\int 3x \ln(x^7) dx = \underline{\hspace{4cm}}$$

3. Evaluate

$$\int x^3 \ln(2x) dx$$

$$\int x^3 \ln(2x) dx = \underline{\hspace{10em}}$$

4. Evaluate the definite integral.

$$\int_0^3 5xe^{3x} dx$$

$$\int_0^3 5xe^{3x} dx = \underline{\hspace{10em}}$$

5. Evaluate the indefinite integral.

$$\int_0^{\pi/4} 5x \sin(2x) dx$$

$$\int_0^{\pi/4} 5x \sin(2x) dx = \underline{\hspace{10em}}$$

6. Evaluate the indefinite integral.

$$\int 4t\sqrt{2t+5} dt$$

$$\int 4t\sqrt{2t+5} dt = \underline{\hspace{10em}}$$

7. The velocity of a cyclist during an hour-long race is given by the function

$$v(t) = 166te^{-2.2t} \text{ mi/hr}, \quad 0 \leq t \leq 1$$

Assuming the cyclist starts from rest, what is the distance in miles he traveled during the first hour of the race?

Answer: _____

-
8. After t days, the growth of a plant is measured by the function $2000te^{-20t}$ inches per day. What is the change in the height of the plant (in inches) after the first 14 days?

Answer: _____

-
9. A model for the ability of a child to memorize information, measured on a scale from 1 to 100, is given by

$$M(t) = 1.9t \ln(t),$$

$2 \leq t \leq 8$, where t is the child's age in years. Find the child's average memorization ability between ages 2 and 7 years. Round to three decimal places.

Answer: _____

-
10. Which of the following is a partial fraction decomposition of the rational expression show? Do not explicitly solve for the constant.

$$f(x) = \frac{3x + 1}{x^2(x + 1)^2(x^2 + 1)}$$

- (A) $\frac{A}{x^2} + \frac{B}{(x + 1)^2} + \frac{C}{x^2 + 1}$
- (B) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x + 1} + \frac{D}{(x + 1)^2} + \frac{E}{x^2 + 1}$
- (C) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x + 1} + \frac{D}{(x + 1)^2} + \frac{Ex + F}{x^2 + 1}$
- (D) $\frac{A}{x} + \frac{Bx + C}{x^2} + \frac{D}{x + 1} + \frac{Ex + F}{(x + 1)^2} + \frac{Gx + H}{x^2 + 1}$
- (E) $\frac{A}{x} + \frac{B}{(x + 1)^2} + \frac{C}{x^2 + 1}$

11. Which of the following is a partial fraction decomposition of the rational expression show? Do not explicitly solve for the constant.

$$f(x) = \frac{7x - 5}{x^2(x^2 + 9)}$$

- (A) $\frac{A}{x} + \frac{B}{x} + \frac{Cx + D}{x^2 + 9}$
- (B) $\frac{A}{x} + \frac{B}{x^2} + \frac{Cx + D}{x^2 + 9}$
- (C) $\frac{A}{x} + \frac{Bx + C}{x^2} + \frac{Dx + E}{x^2 + 9}$
- (D) $\frac{Ax + B}{x^2} + \frac{Cx + D}{x^2 + 9}$
- (E) $\frac{A}{x} + \frac{B}{x^2} + \frac{C}{x + 3} + \frac{D}{x - 3}$
- (F) $\frac{Ax + B}{x^2} + \frac{C}{x + 3} + \frac{D}{x - 3}$

-
12. Which of the following is a partial fraction decomposition of the rational expression show? Do not explicitly solve for the constant.

$$f(x) = \frac{x^2 + 2x + 3}{(x-1)^2(x-2)(x^2+4)}$$

- (A) $\frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x-2} + \frac{Dx+E}{x^2+4}$
- (B) $\frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x-2} + \frac{D}{x^2+4}$
- (C) $\frac{A}{x-1} + \frac{Bx+C}{(x-1)^2} + \frac{D}{x-2} + \frac{E}{x^2+4}$
- (D) $\frac{A}{x-1} + \frac{B}{(x-1)^2} + \frac{C}{x-2} + \frac{Dx}{x^2+4}$
- (E) $\frac{A}{x-1} + \frac{Bx}{(x-1)^2} + \frac{C}{x-2} + \frac{Dx+E}{x^2+4}$

13. Which of the following is a partial fraction decomposition of the rational expression show? Do not explicitly solve for the constant.

$$f(x) = \frac{24}{(x^2-16)^2}$$

- (A) $\frac{A}{x-4} + \frac{Bx+C}{(x-4)^2} + \frac{D}{x+4} + \frac{Ex+F}{(x+4)^2}$
- (B) $\frac{A}{x+2} + \frac{B}{(x+2)^2} + \frac{C}{x-2} + \frac{D}{(x-2)^2} + \frac{E}{x+4} + \frac{F}{(x+4)^2}$
- (C) $\frac{Ax+B}{(x-4)^2} + \frac{Cx+D}{(x+4)^2}$
- (D) $\frac{A}{x-4} + \frac{B}{(x-4)^2} + \frac{C}{x+4} + \frac{D}{(x+4)^2}$
- (E) $\frac{Ax+B}{x^2-16} + \frac{Cx+D}{(x^2-16)^2}$
- (F) $\frac{A}{(x^2-16)^2} + \frac{Bx+C}{(x^2-16)^2}$

14. Determine the partial fraction decomposition of

$$\frac{7x^2 + 9}{x(x^2 + 3)}$$

Answer: _____

15. Determine the partial fraction decomposition of

$$\frac{4x - 11}{x^2 - 7x + 10}$$

Answer: _____

16. Evaluate $\int \frac{5x^2 + 9}{x^2(x + 3)} dx$

$$\int \frac{5x^2 + 9}{x^2(x + 3)} dx = \underline{\hspace{10em}}$$

17. Evaluate $\int \frac{x^2 + 2}{x^3 + 3x^2 + 2x} dx$

$$\int \frac{x^2 + 2}{x^3 + 3x^2 + 2x} dx = \underline{\hspace{10em}}$$

18. Evaluate $\int \frac{9x^2 - 4x + 5}{(x - 1)(x^2 + 1)} dx$

$$\int \frac{x^2 + 2}{x^3 + 3x^2 + 2x} dx = \underline{\hspace{2cm}}$$

19. Evaluate $\int \frac{3x^2 + 3x + 15}{x^3 + 5x^2} dx$

$$\int \frac{3x^2 + 3x + 15}{x^3 + 5x^2} dx = \underline{\hspace{10em}}$$

20. 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 $[0, \pi/2]$.

21. 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 $[0, \pi/2]$.

22. 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 $[0, \pi/2]$.

23. Which of the following integrals are diverges?

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

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

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

- (A) I only
- (B) II only
- (C) III only
- (D) I and II only
- (E) I and III only
- (F) I, II, and III

24. Which of the following integrals are improper?

I. $\int_0^{\pi/4} \cos(x) dx$

II. $\int_0^{\pi/4} \tan(2x) dx$

III. $\int_{\pi/4}^{\pi/2} \csc(x) dx$

IV. $\int_{\pi/4}^{\pi/2} \sec\left(\frac{x}{2}\right) dx$

- (A) II and IV only
- (B) I and II only
- (C) I and IV only
- (D) I and III only
- (E) II, III and IV only
- (F) II only

25. Evaluate the following integral;

$$\int_0^{\infty} e^{-x/6} dx$$

$$\int_0^{\infty} e^{-x/6} dx = \underline{\hspace{10cm}}$$

26. Evaluate the following integral;

$$\int_0^{\infty} \frac{7}{e^{10x}} dx$$

$$\int_0^{\infty} \frac{7}{e^{10x}} dx = \underline{\hspace{10cm}}$$

27. Evaluate the definite integral

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

$$\int_2^{\infty} \frac{dx}{5x+2} = \underline{\hspace{10cm}}$$

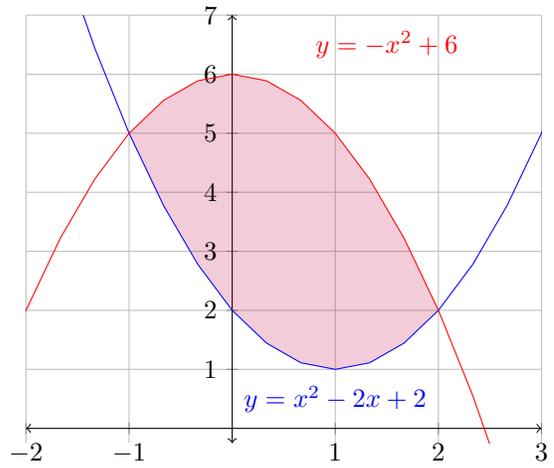
28. Evaluate the definite integral

$$\int_4^{13} \frac{dx}{\sqrt{x-4}}$$

$$\int_4^{13} \frac{dx}{\sqrt{x-4}} = \underline{\hspace{10em}}$$

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

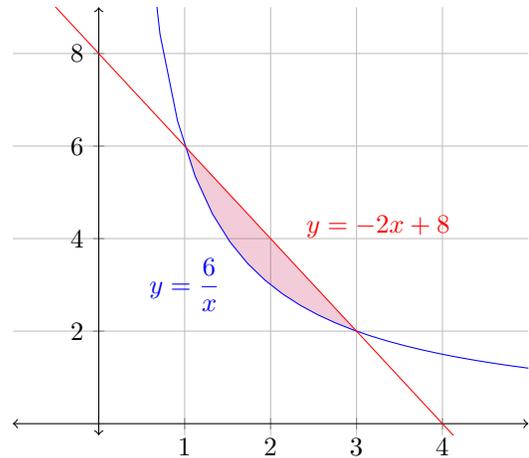
DON'T COMPUTE IT!!!



Area = $\underline{\hspace{10em}}$

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

DON'T COMPUTE IT!!!



Area = $\underline{\hspace{10em}}$

31. 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 = _____

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

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

Area = _____

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

Area = _____

34. Find the area bounded by the following curves.

$$x = y^2 + 24 \quad \text{and} \quad x = 10y$$

Area = _____

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

Area = _____

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

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

Area = _____

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

$$y = x^3 \quad \text{and} \quad y = x^2$$

Area = _____

38. 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?

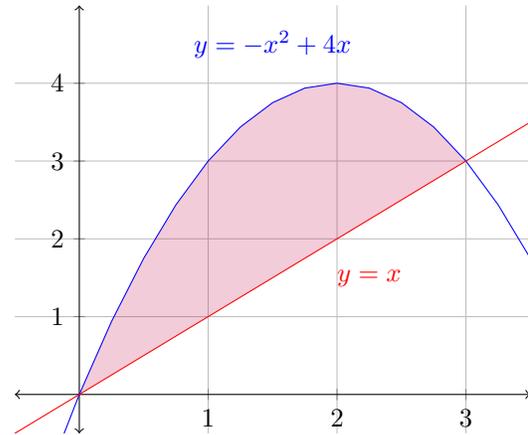
Answer: _____

-
39. The birthrate of a particular population is modeled by $B(t) = 1000e^{0.036t}$ people per year, and the death rate is modeled by $D(t) = 725e^{0.019t}$ people per year. How much will the population increase in the span of 10 years? ($0 \leq t \leq 20$) Round to the nearest whole number.

Answer: _____

40. 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 = _____

41. 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 = _____

42. 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 = _____

43. Find the volume of the solid that results by revolving the region enclosed by the curves $y = \frac{5}{x}$, $y = 0$, $x = 5$, and $x = 7$ about the x-axis.

Volume = _____

44. 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 = _____

45. 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 = _____

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

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

about the y-axis

Volume = _____

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

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

about the x-axis

Volume = _____

-
48. Set up the integral that computes the **VOLUME** of the region generated by revolving the region in Quadrant I bounded by the following curves about the y -axis using the disk/washer method.

$$y = 4 - x^2, \quad y = 0 \quad \text{and} \quad x = 0$$

Volume = _____

49. Find the volume of the solid generated by revolving the region bounded by $x + y = 2$ in Quadrant I about the y -axis.

Volume = _____

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

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

around the x-axis

Volume = _____

51. 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 = _____

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

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

around the y -axis.

Volume = _____

53. 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 = _____

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

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

around the y-axis

Volume = _____

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

$$y = x + 2, \quad x = 0, \quad y = 6$$

around the y-axis

Volume = _____

-
56. Find the volume of the solid generated by revolving the region bounded by the following curves about the x -axis.

$$y = 2x, \quad y = 5x, \quad \text{and } x = 1$$

Volume = _____

57. Find the volume of the solid generated by revolving the region bounded by the following curves about the line $x = 2$

$$y = 2x, \quad y = 0, \quad \text{and } x = 1$$

Volume = _____

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

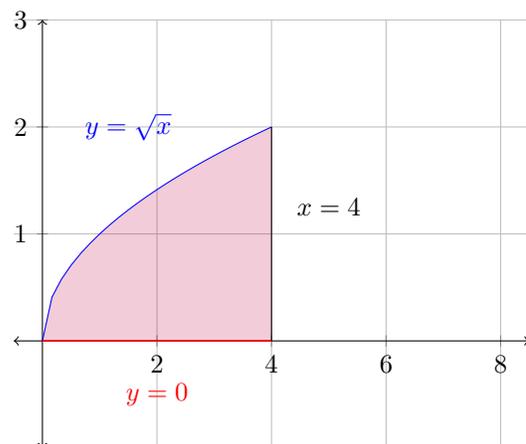
$$x + 3y = 9, \quad x = 0, \quad y = 0$$

around the y -axis

Volume = _____

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

DON'T COMPUTE IT!!!



Volume = _____

60. **SET-UP using the washer method.** the **VOLUME** of the region bounded by

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

around the x-axis

(A) $\pi \int_0^2 (2x - x^2)^2 dx$

(B) $\pi \int_0^2 (4x^2 - x^4) dx$

(C) $\pi \int_0^2 (2x - x^2) dx$

(D) $\pi \int_0^2 (x^2 - 2x) dx$

(E) $\pi \int_0^2 (x^4 - 4x^2) dx$

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

61. 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 = _____

62. **SET-UP using the disk/washer method.** the **VOLUME** of the region bounded by

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

around the line $y = 27$

(A) $\pi \int_0^{27} (729 - 162x + 9x^2) dx$

(B) $\pi \int_0^{27} 9x^2 dx$

(C) $\pi \int_0^9 9x^2 dx$

(D) $\pi \int_0^9 (9x^2 - 162x) dx$

(E) $\pi \int_0^{27} (729 - 9x^2) dx$

(F) $\pi \int_0^9 (729 - 162x + 9x^2) dx$