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.

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

$$\int_0^{\pi/2} (x-1)\sin(x)\,dx = \underline{\hspace{5cm}}$$

2. Evaluate

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

$$\int 3x\ln(x^7)\,dx = \underline{\hspace{6cm}}$$

3. Evaluate

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

$$\int x^3 \ln(2x)\, dx = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

4. Evaluate the definite integral.

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

$$\int_0^3 5xe^{3x}\, dx = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_$$

5. Evaluate the indefinite integral.

$$\int 4x \sin(7x)\, dx$$

$$\int 4x \sin(7x)\, dx = \underline{\hspace{6cm}}$$

6. Evaluate the indefinite integral.

$$\int 6t\sqrt{2t+5}\, dt$$

$\int 6t\sqrt{2t+5}\, dt = \underline{\hspace{6cm}}$

7. 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:________________________________

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

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

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

Answer:______________________________

9. 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) $\frac{A}{x} + \frac{B}{(x+1)^2} + \frac{C}{x^2+1}$

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

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

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

11. Determine the partial fraction decomposition of

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

Answer:______________________________

12. Determine the partial fraction decomposition of

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

Answer: ____________________

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

$\int \frac{5x^2+9}{x^2(x+3)}\,dx$= ____________________________

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

$$\int \frac{x^2+2}{x^3+3x^2+2x}\,dx = \underline{\hspace{6cm}}$$

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

$$\int \frac{x^2+2}{x^3+3x^2+2x}\, dx = \underline{\hspace{6cm}}$$

16. 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 $[0, \pi/2]$.

17. 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 $[0, \pi/2]$.

18. 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 $[0, \pi/2]$.

19. Evaluate the following integral;

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

$$\int_1^\infty \frac{5}{\sqrt{x}} dx \quad = \quad \rule{5cm}{0.4pt}$$

20. Evaluate the following integral;

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

$$\int_1^\infty \frac{3}{x^2} dx \quad = \quad \rule{5cm}{0.4pt}$$

21. Evaluate the following integral;

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

$$\int_1^\infty \frac{10}{x} dx \quad = \quad \rule{5cm}{0.4pt}$$

22. Evaluate the following integral;

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

$$\int_0^{\infty} \frac{7}{e^{10x}}\,dx \quad = \quad \rule{5cm}{0.4pt}$$

23. Evaluate the definite integral

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

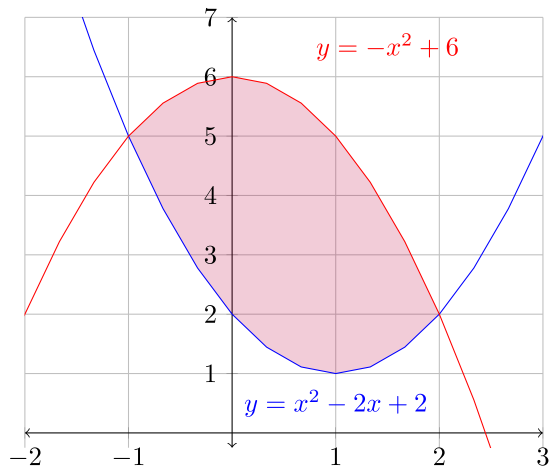
$$\int_2^{\infty} \frac{dx}{5x+2} = \rule{5cm}{0.4pt}$$

24. The rate at which a factory is dumping pollution into a river at any time t is given by $P(t) = P_0 e^{-kt}$, where P_0 is the rate at which the pollution is initially released into the river. If $P_0 = 3000$ and $k = 0.080$, find the total amount of pollution that will be released into the river into the indefinite future.

Answer: ____________________

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

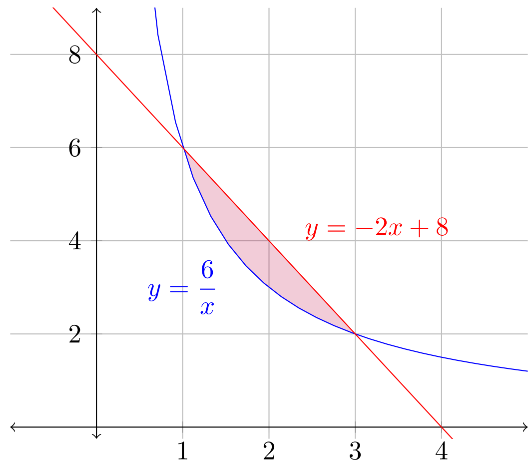
DON'T COMPUTE IT!!!



Area = ____________________

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

DON'T COMPUTE IT!!!



Area = ____________________

27. 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 $=$ ____________________

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

Area $=$ ____________________

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

Area $=$ ____________________________

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

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

Area $=$ ____________________________

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

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

Area $=$ ______________________________

32. 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?

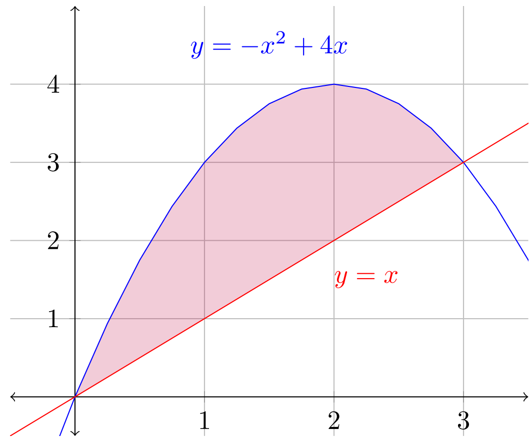
Answer: ______________________________

33. 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: ____________________

34. 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 = ________________________

35. 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 = ________________________

36. 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 $=$ ____________________

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

Volume $=$ ____________________

38. 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 = ______________________

39. 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 = ______________________

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

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

about the y-axis

Volume $=$ ______________________________

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

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

about the x-axis

Volume $=$ ______________________________

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

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

around the x-axis

Volume = ____________________

43. 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 = ____________________

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

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

around the y-axis.

Volume $=$ ____________________

45. 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 $=$ ____________________

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

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

around the y-axis

Volume $=$ ____________________

47. 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 $=$ ____________________

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

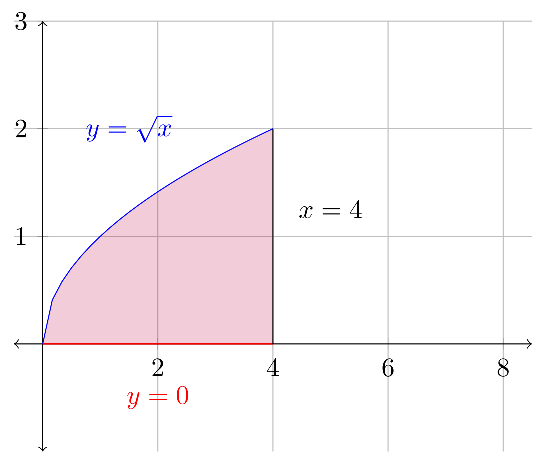
$$x + 3y = 9, \quad x = 0, \quad y = 0$$

around the y-axis

Volume $=$ ______________________

49. 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 $=$ ______________________

50. 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 $=$ ______________________

51. **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) $\pi \int_0^{9} (729 - 162x + 9x^2)\, dx$

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

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

around the line $y = 27$

Volume $=$ ____________________

53. **SET-UP using the Shell method**, the integral that computes the **VOLUME** of the region in quadrant I enclosed by the region defined by a triangle with vertices at (0,0), (0,5), and (4,0) about the y-axis.

(A) $\pi \displaystyle\int_0^5 \left(8x - \frac{5}{4}x^2\right)\, dx$

(B) $\pi \displaystyle\int_0^5 \frac{5}{4}x^2\, dx$

(C) $\pi \displaystyle\int_0^4 4x^2\, dx$

(D) $\pi \displaystyle\int_0^4 \left(8x - \frac{5}{4}x^2\right)\, dx$

(E) $\pi \displaystyle\int_0^4 \left(10x - \frac{5}{2}x^2\right)\, dx$

(F) $\pi \displaystyle\int_0^5 \left(10x - \frac{5}{2}x^2\right)\, dx$

54. 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 $=$ ____________________________

55. 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 $=$ ____________________________

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

$$y = 3\sqrt{x}, \quad \text{and} \quad y = x$$

about the $x = 12$.

Volume $=$ ____________________

57. 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 $=$ ____________________

58. 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 $=$ ______________________________

59. 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 $=$ ______________________________