

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 1) Determine if the function F is the general antiderivative of the function f .

1) _____

$$F(x) = 6x + \frac{x^3}{2} + C; \quad f(x) = 6 + 3x^2$$

A) yes

B) no

- 2) Determine if the function F is the general antiderivative of the function f .

2) _____

$$F(t) = -\frac{4}{5t^3} + C; \quad f(t) = \frac{12}{5t^4}$$

A) no

B) yes

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

Find all antiderivatives of the function.

3) $f(x) = e^{-x/2}$

3) _____

Enter your answer with any fractional coefficients and powers in reduced form $\frac{a}{b}$.

4) $f(x) = x^3$

4) _____

Enter your answer as a polynomial in x in standard form.

5) $f(y) = y^4$

5) _____

Enter your answer as a polynomial in y in standard form.

6) $f(x) = x^5$

6) _____

Enter your answer as a polynomial in x in standard form.

7) $f(x) = x^{15}$

7) _____

Enter your answer as a polynomial in x in standard form.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

8) Find: $\int \left(\frac{x^2}{4} - 4 \right) dx$ 8) _____

A) $\frac{x^3}{12} - 4x + C$

B) $\frac{3x^3}{4} - 4 + C$

C) $\frac{x}{2} + C$

D) $\frac{x^2}{4} - 4 + C$

E) none of these

9) Find: $\int \left(4\sqrt{x} - \frac{1}{2\sqrt{x}} \right) dx$ 9) _____

A) $2x^{3/2} + \frac{1}{4}x^{1/2} + C$

B) $6x^{3/2} - \frac{1}{2} \ln|\sqrt{x}| + C$

C) $\frac{2}{\sqrt{x}} + \frac{1}{4x^{3/2}} + C$

D) $\frac{8}{3}x^{3/2} - x^{1/2} + C$

10) Find: $\int \left(\frac{6}{5}x^5 + 4e^{-2x} \right) dx$ 10) _____

A) $6x^6 - 2e^{-2x} + C$

B) $6x^4 - 8e^{-2x} + C$

C) $6x^6 - 2e^{-3x} + C$

D) $\frac{1}{5}x^6 - 2e^{-2x} + C$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

11) Find: $\int \left(4x^{3/2} - \frac{1}{2x^{3/2}} \right) dx$ 11) _____

Integrate the terms in the order they appear.

Enter your answer as a sum of power functions in standard form with any fractional powers or coefficients reduced of form $\frac{a}{b}$.

12) Find: $\int (2x + 1)^2 dx$ 12) _____

Enter your answer as a polynomial in x in standard form with any fractional coefficients or powers reduced of form $\frac{a}{b}$.

- 13) Find: $\int (3x + 2)^2 dx$ 13) _____
Enter your answer as a polynomial in x in standard form with any fractional coefficients or powers reduced of form $\frac{a}{b}$.
- 14) Find: $\int (x^3 + 1) dx$ 14) _____
Enter your answer as a polynomial in x in standard form with any fractional coefficients or powers reduced of form $\frac{a}{b}$.
- 15) Find: $\int \frac{dx}{x^{1/5}}$ 15) _____
Enter your answer as a power function in x in standard form with any fractional coefficients or powers in reduced form $\frac{a}{b}$ and any constant at the right end.
- 16) Find: $\int \frac{1 + x^2}{x^2} dx$ 16) _____
Enter terms in the order in which they appear in standard power function forms with any constant at the right end.
- 17) Find: $\int 2e^{-2x} dx$ 17) _____
Enter your answer in standard form (no fractions).
- 18) Find: $\int \frac{dx}{e^{3x}}$ 18) _____
Enter your answer in standard form (use ae^b).
- 19) Find: $\int (2x^4 + 3x - 4) dx$ 19) _____
Enter a polynomial in x in standard form with any fractional coefficients or powers in reduced form $\frac{a}{b}$.
- 20) Find: $\int \frac{x - 7}{x} dx$ 20) _____
Enter terms in the same order in which they appear in the integral.
- 21) Find: $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}} \right) dx$ 21) _____
Enter your answer using standard power function form (ax^b), leaving the terms in the order in which they appear in the integral.

22) Find: $\int (3x^{1/3}) dx$. 22) _____

Enter using standard power function form ax^b , with any fractions reduced of form $\frac{a}{b}$.

23) Find: $\int -3(e^{x/2} + 1) dx$ 23) _____

Enter your terms in the same order in which they appear in the integral with each term in standard power function form; any fractions reduced form $\frac{a}{b}$.

24) Find: $\int \left(x^2 - \frac{1}{4x} \right) dx$ 24) _____

Enter your terms in standard forms in the order in which they appear in the integral.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate.

25) $\int x^7 dx$ 25) _____
 A) $\frac{1}{8}x^8 + C$ B) $\frac{1}{7}x^6 + C$ C) $7x^6 + C$ D) $8x^8 + C$

26) $\int 32 dx$ 26) _____
 A) $16x^2 + C$ B) $32x + C$ C) 0 D) $32 + C$

27) $\int (7x^2 - 4x) dx$ 27) _____
 A) $\frac{7}{3}x^3 - 2x^2 + C$ B) $\frac{7}{3}x^2 + 2x + C$
 C) $\frac{7}{3}x^3 + C$ D) $-\frac{7}{3}x^3 - 2x^2 + C$

28) $\int \frac{53}{x} dx$ 28) _____
 A) $53x + C$ B) $53 \ln x + C$ C) $\frac{53}{2}x^{-2} + C$ D) $\ln \left(\frac{x}{53} \right) + C$

29) $\int (x^5 + e^{5x}) dx$ 29) _____
 A) $\frac{x^6}{6} + \frac{e^{6x}}{6} + C$ B) $\frac{x^6}{6} + \frac{e^{5x}}{5} + C$ C) $\frac{x^6}{6} + e^{5x} + C$ D) $\frac{x^4}{4} + 5e^{5x} + C$

Find the value of k that makes the antidifferentiation formula true.

30) $\int x^{-7} dx = kx^{-6} + C$ 30) _____
A) $\frac{1}{6}$ B) 6 C) $-\frac{1}{6}$ D) -6

31) $\int (7 - x)^{-1} dx = k \ln|7 - x| + C$ 31) _____
A) 1 B) $-\frac{1}{7}$ C) $\frac{1}{7}$ D) -1

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

32) Find all functions $f(x)$ with the following property: $f'(x) = x^5 + 2x^3 - 3x^2 + 6$. 32) _____
Enter your answer as a polynomial in x in standard form with any fractional coefficients
or powers reduced of form $\frac{a}{b}$.

33) Find all functions $f(x)$ with the following property: $f'(x) = 3x^2 + 2x + 1$. 33) _____
Enter your answer as a polynomial in x in standard form with any fractional coefficients
or powers reduced of form $\frac{a}{b}$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

34) Find a function $f(x)$ with the following property: $f'(x) = -\frac{1}{4-x}$, $f(2) = 0$. 34) _____
A) $f(x) = -(4-x)^{-2} + \frac{1}{\sqrt{2}}$
B) $f(x) = \ln\left|\frac{1}{4-x}\right| + \frac{1}{2}$
C) $f(x) = \ln|4-x| - 2$
D) $f(x) = -\ln|4-x| + 2$
E) none of these

35) Find a function $f(x)$ with the following property: $f'(x) = x^6 + \frac{x^4}{3} - x^3 + \frac{5}{3}x^2$, $f(0) = e$. 35) _____
A) $f(x) = \frac{x^7}{7} + \frac{x^5}{15} - \frac{x^4}{4} + \frac{5}{9}x^3 + e$ B) $f(x) = 6x^7 + \frac{4}{3}x^5 - 3x^4 + \frac{10}{3}x^3$
C) $f(x) = \frac{x^7}{6} + \frac{x^5}{12} - \frac{x^4}{3} + \frac{5}{6}x^3 + ex$ D) $f(x) = 7e^7 + \frac{5}{3}e^5 - 4e^4 + 5e^3$

36) Find a function $f(x)$ with the following property: $f'(x) = 2e^{2x} - \frac{4}{x} + \frac{3}{x^2}$, $f(1) = -2$. 36) _____

A) $f(x) = \frac{2}{3}e^{3x} - 4x - \frac{1}{x} + \frac{5}{3}$

B) $f(x) = e^{2x} - 4 \ln|x| - \frac{6x}{x^3} + 3 + 4e$

C) $f(x) = \frac{2}{3}e^{3x} - 4 \ln|x| - \frac{1}{x} - \frac{5}{3}$

D) $f(x) = e^{2x} - 4 \ln|x| - \frac{3}{x} - (e^2 - 1)$

37) Suppose $f(x)$ is an antiderivative of $\frac{2}{\sqrt{x}}$ and $f(0) = 1$. What is $f(9)$? 37) _____

A) $-\frac{4}{3}$

B) 13

C) -4

D) 1

E) none of these

Find f such that the given conditions are satisfied.

38) $f'(x) = x - 2$, $f(3) = 8$ 38) _____

A) $f(x) = x^2 - 2x$

B) $f(x) = \frac{x^2}{2} - 2x + \frac{21}{2}$

C) $f(x) = x^2 - 2x + 5$

D) $f(x) = \frac{x^2}{2} - 2x + \frac{19}{2}$

39) $f'(x) = x^2 + 9$, $f(0) = 20$ 39) _____

A) $f(x) = x^3 + 9x^2 + 20$

B) $f(x) = \frac{x^3}{3} + 9x + 20$

C) $f(x) = \frac{x^3}{3} + 9x$

D) $f(x) = x^3 + 9x + 20$

40) $f'(x) = x^2 - 11x + 6$, $f(0) = 6$ 40) _____

A) $f(x) = \frac{1}{3}x^3 - 12x^2 + 6x + 6$

B) $f(x) = \frac{1}{3}x^3 - \frac{11}{2}x^2 + 6x + 6$

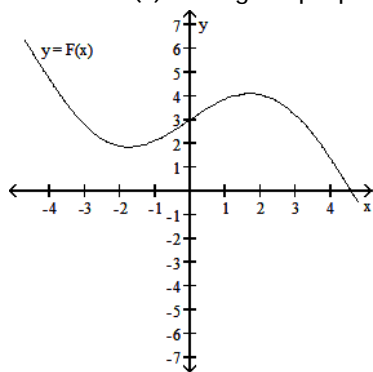
C) $f(x) = \frac{1}{3}x^3 - 12x^2 + 6x + 1$

D) $f(x) = \frac{1}{3}x^3 - \frac{11}{2}x^2 + 6x + 1$

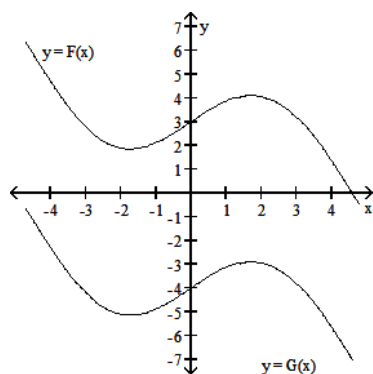
Refer to the graph to answer the question.

- 41) The graph below shows the function $F(x)$. On the same coordinate system, draw the graph of the function $G(x)$ having the properties $G(0) = -4$ and $G'(x) = F'(x)$ for all x .

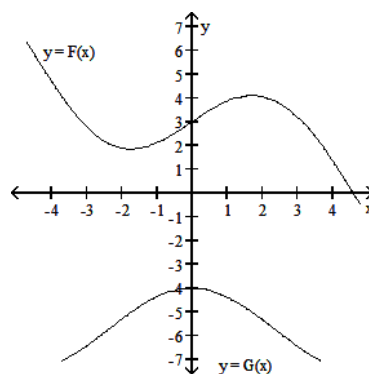
41) _____



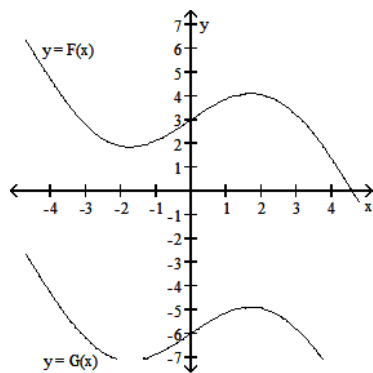
A)



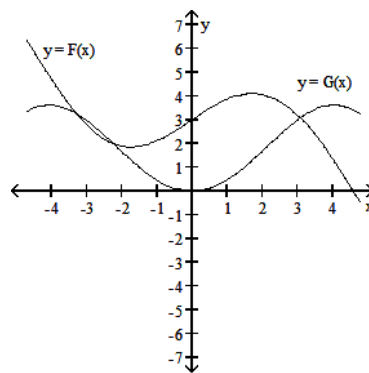
B)



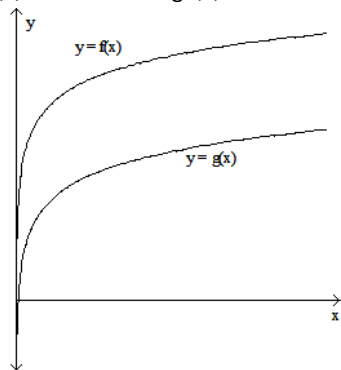
C)



D)



- 42) The function $g(x)$ in the graph below resulted from shifting the graph of $f(x)$ down 3 units. If $f'(2) = 1$, what is $g'(2)$? 42) _____



- A) $g'(2) = 3$ B) $g'(2) = 2$ C) $g'(2) = 1$ D) $g'(2) = 4$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 43) A rock is dropped from a balloon hovering at 4800 ft above the ground. Its velocity at time t seconds is $v(t) = -32t$ feet per second. Find how long it takes for the rock to reach the ground. 43) _____
Enter just a real number to one decimal place (no units).
- 44) A ball is thrown upward with initial velocity of 144 feet per second. How high will the ball go? (Recall that from physics, it is known that the velocity at time t is $144 - 32t$ feet per second.) 44) _____
Enter just an integer (no units).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 45) A company estimates that its marginal profit for producing a product is given by $MP(q) = 60 - 0.12q$ where $MP(q)$ is in dollars per unit. Given that $P = -500$ when $q = 0$, find the total profit realized from selling 300 units of product. 45) _____
A) \$6700 B) \$12,100 C) \$4100 D) \$7700
- 46) A newspaper is launching a new advertising campaign in order to increase the number of daily subscribers. The newspaper currently ($t = 0$) has 26,000 daily subscribers and management expects that number, $S(t)$, to grow at the rate of $S'(t) = 80t^{1/2}$ subscribers per day, where t is the number of days since the campaign began. How long (to the nearest day) should the campaign last if the newspaper wants the number of daily subscribers to grow to 49,000? 46) _____
A) 57 days B) 69 days C) 44 days D) 33 days

Solve the problem.

- 47) Find a company's total-cost function if its marginal cost function is $C'(x) = 14x - 2$ and its fixed cost is \$7. 47) _____

A) $C(x) = 14x^2 - 2x + 7$

B) $C(x) = 14x^2 - 2x + 6$

C) $C(x) = 7x^2 - 2x + 7$

D) $C(x) = 7x^2 - 2x + 6$

- 48) A company finds that its marginal revenue from the sale of the x th unit of its product is given by $R'(x) = 8x^2 - 5$. Assuming that $R(0) = 0$, find the total-revenue function R . 48) _____

A) $R(x) = \frac{8}{3}x^3 - 5x$

B) $R(x) = 16x$

C) $R(x) = \frac{8}{3}x^3 - \frac{5}{2}x$

D) $R(x) = 4x^3 - 5x^2$

- 49) The rate at which an assembly line worker's efficiency E (expressed as a percent) changes with respect to time t is given by $E'(t) = 60 - 6t$, where t is the number of hours since the worker's shift began. Assuming that $E(1) = 92$, find $E(t)$. 49) _____

A) $E(t) = 60t - 3t^2 + 35$

B) $E(t) = 60t - 6t^2 + 35$

C) $E(t) = 60t - 3t^2 + 149$

D) $E(t) = 60t - 3t^2 + 92$

- 50) An object's acceleration at time t is given by $v'(t) = 14t$, and its initial velocity $v(0)$ is 35. Find the velocity function $v(t)$. 50) _____

A) $v(t) = 14t^2 + 35$

B) $v(t) = 7t^2 + 35t$

C) $v(t) = 35t^2 + 14$

D) $v(t) = 7t^2 + 35$

Calculate.

- 51) $\int_0^1 \frac{2}{3-2x} dx$ 51) _____

A) $\ln 3$

B) $-e + \ln 3$

C) $\frac{4}{3}$

D) $-\ln 3$

E) none of these

- 52) $\int_{-1}^1 e^{-2x} dx$ 52) _____

A) $\frac{1}{2}(e^2 - e^{-2})$

B) $e^2 - e^2$

C) $-\frac{1}{2}e^{-2x} + C$

D) $\frac{1}{2}(e^2 - e^2)$

E) none of these

$$53) \int_0^1 \left(e^{3x} - \frac{1}{(x+1)^2} \right) dx$$

53) _____

A) $\frac{1}{3}e^3 - e - \frac{1}{2}$

B) $\frac{1}{3}e^3 - \frac{5}{6}$

C) $\frac{1}{3}e + \frac{7}{6}$

D) $\frac{1}{3}e^3 + \frac{7}{6}$

E) none of these

$$54) \int_{-2}^{-1} (x^2 - 2x^{-3} + 3) dx$$

54) _____

A) $-\frac{49}{12}$

B) $\frac{73}{12}$

C) $-\frac{89}{12}$

D) $-\frac{151}{12}$

E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

$$55) \int_1^4 \sqrt{x} dx$$

55) _____

Enter just a reduced fraction of form $\frac{a}{b}$.

$$56) \int_0^1 (e^{3x} - 1) dx$$

56) _____

Enter your answer as $a(e^b \pm e^c)$. Any fractions in reduced form $\frac{a}{b}$.

$$57) \int_1^2 \left(\frac{1}{x^2} - 3 \right) dx$$

57) _____

Enter just a reduced fraction of form $\frac{a}{b}$.

$$58) \int_0^2 (3e^4 - 2x) dx$$

58) _____

Enter your answer as $a(b + e^c)$ with any fractions in reduced form $\frac{e}{f}$.

$$59) \int_1^2 5x dx$$

59) _____

Enter your answer as a reduced fraction of form $\frac{a}{b}$.

$$60) \int_0^2 (x^3 + 3x^2 + x + 1) dx$$

60) _____

Enter just an integer.

$$61) \int_2^{10} \frac{1}{x-1} dx$$

61) _____

Enter just a real number (no approximations).

$$62) \int_{-100,000}^{100,000} x^3 dx$$

62) _____

Enter just an integer.

$$63) \int_1^3 (x^3 + 3)x^2 dx$$

63) _____

Enter a reduced fraction of form $\frac{a}{b}$.

$$64) \int_0^1 (2x^4 + 5x + 1) dx$$

64) _____

Enter a reduced fraction of form $\frac{a}{b}$.

$$65) \int_1^4 3\sqrt{x} dx$$

65) _____

Enter just an integer.

$$66) \int_3^5 e^{5x} dx$$

66) _____

Enter your answer as $a(e^b - e^c)$.

$$67) \int_2^5 \left(e^{4x} - \frac{1}{x} \right) dx$$

67) _____

Enter your answer as $a(e^b - e^c) + d$.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Evaluate.

$$68) \int_0^4 2\sqrt{x} \, dx$$

68) _____

A) $\frac{32}{3}$

B) 4

C) 24

D) 16

$$69) \int_{-2}^5 4x^3 \, dx$$

69) _____

A) 609

B) 2436

C) 21

D) -609

$$70) \int_1^e \frac{5}{x} \, dx$$

70) _____

A) -5

B) $-\frac{5}{2}e^2$

C) 5

D) 0

$$71) \int_0^1 \frac{7}{10}x^2 \, dx$$

71) _____

A) $\frac{7}{10}$

B) $-\frac{7}{30}$

C) $\frac{7}{5}$

D) $\frac{7}{30}$

$$72) \int_{-3}^0 \frac{1}{4}x^3 \, dx$$

72) _____

A) $\frac{81}{4}$

B) $-\frac{81}{4}$

C) $-\frac{81}{16}$

D) $\frac{81}{16}$

$$73) \int_0^5 \sqrt{5x} \, dx$$

73) _____

A) $\frac{75}{2}$

B) 5

C) $\frac{50}{3}$

D) 25

Compute the net change of the function.

$$74) \text{ Given } f'(x) = 3x^2 + 7, \text{ compute } f(2) - f(-2).$$

74) _____

A) 4

B) 44

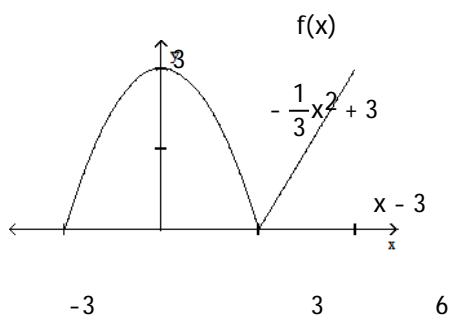
C) 0

D) -44

Refer to the figure to evaluate the definite integral.

75) Evaluate $\int_{-3}^6 f(x) dx$

75) _____



A) 33

B) $\frac{33}{2}$

C) $\frac{57}{2}$

D) $\frac{99}{2}$

Solve the problem.

76) Suppose that f and g are continuous and that $\int_6^{10} f(x) dx = -3$ and $\int_6^{10} g(x) dx = 10$.

76) _____

Find $\int_6^{10} [3f(x) + g(x)] dx$.

A) 1

B) 21

C) 13

D) 27

77) Suppose that f and g are continuous and that $\int_5^9 f(x) dx = -5$ and $\int_5^9 g(x) dx = 10$.

77) _____

Find $\int_5^9 [f(x) - 3g(x)] dx$.

A) -45

B) -15

C) -35

D) 25

78) Suppose that f and g are continuous and that $\int_6^{10} f(x) dx = -4$ and $\int_6^{10} g(x) dx = 8$.

78) _____

Find $\int_{10}^6 [g(x) - f(x)] dx$.

A) 12

B) 4

C) -4

D) -12

79) Suppose that g is continuous and that $\int_4^5 g(x) dx = 10$ and $\int_4^8 g(x) dx = 15$. Find $\int_5^8 g(x) dx$.

79) _____

A) 5

B) -5

C) -25

D) 25

- 80) Suppose that f is continuous and that $\int_{-2}^2 f(x) dx = 0$ and $\int_{-2}^7 f(x) dx = 4$. Find $\int_2^7 f(x) dx$. 80) _____
- A) -8 B) 8 C) 4 D) -4

Combine the integrals into one integral and then evaluate.

- 81) $\frac{1}{2} \int_1^3 (6x^2 - x + 10) dx + 2 \int_1^3 \left(x^3 + 3 - \frac{3}{2}x^2 \right) dx$ 81) _____
- A) 27 B) 43 C) 54 D) 47

- 82) $\int_{-2}^0 (-9x^2 - 4x) dx + \int_0^2 (-9x^2 - 4x) dx$ 82) _____
- A) -24 B) -48 C) -46 D) -44

Solve the problem.

- 83) If $A(t)$ denotes the annual rate of world consumption of oil at time t (with $t = 0$ corresponding to 1977), which of the following expressions represents the amount of oil consumed between 1977 and 1987? 83) _____
- A) $A'(10)$
 B) $\int_0^{10} A(t) dt$
 C) $\int_0^{10} A'(t) dt$
 D) $\int_{1977}^{1987} A(t) dt$
 E) none of these

- 84) A helicopter rises straight up in the air so that its velocity t seconds after take-off is $v(t) = t^{3/2} + \frac{1}{2}t^{1/2} + 1$ feet per second. If the landing pad is 100 feet above the ground, which of the following gives the height of the helicopter at time t ? 84) _____
- A) $h(t) = \frac{5}{3}t^{5/2} + \frac{3}{4}t^{3/2} + t - 100$
 B) $h(t) = \frac{2}{3}t^{5/2} + \frac{1}{4}t^{3/2} + t + C$
 C) $h(t) = \frac{3}{2}t^{1/2} + \frac{1}{4}t^{-1/2} + 100$
 D) $h(t) = \frac{2}{5}t^{5/2} + \frac{1}{3}t^{3/2} + t + 100$
 E) none of these

- 85) Suppose that during a controlled experiment, the temperature in a test tube at time t is rising at a rate of $6t^2 + 2$ degrees centigrade per minute. If the initial temperature is 0°C , what is the temperature in the test tube after 10 minutes? 85) _____
- A) 524°
 B) 602°
 C) 120°
 D) 2020°
 E) none of these
- 86) Suppose that the marginal revenue for a retailer is $6x^2 - \sqrt{x} + x$ dollars at sales level x . If 4 units are currently being sold, what is the extra revenue received from the sale of 5 additional units? 86) _____
- A) $\frac{11}{6} \approx \$1.83$
 B) $568 + \frac{42}{17} \approx \570.47
 C) $1304 + \frac{259}{6} \approx \1347.17
 D) $\$152$
 E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 87) Suppose that at time t ($0 \leq t \leq 2$, t in months), the sales of a certain commodity are decreasing at a rate of $1000e^{-0.05t}$ units per month. Calculate the total change in sales from $t = 0$ to $t = 2$. 87) _____
- Enter your answer as just $a(1 - e^b)$ where b is a real number to one decimal place.
- 88) Suppose that at time t , a bacteria culture is increasing at the rate of $500e^{0.1t}$ bacteria per hour. Calculate the total increase in the number of bacteria from $t = 0$ to $t = 1$. 88) _____
- Enter your answer in the form $a(e^b - 1)$ where b is a real number to one decimal place.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

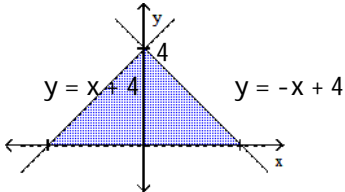
- 89) A manufacturer determined that its marginal cost per unit produced is given by the function $C'(x) = 0.0006x^2 - 0.4x + 83$. Find the total cost of producing the 301st unit through the 400th unit. 89) _____
- A) $\$1683.02$ B) $\$9100$ C) $\$1700$ D) $\$5400$
- 90) A kitchen remodeling company determines that the marginal cost, in dollars per foot, of installing x feet of kitchen countertop is given by $C'(x) = 7x^{-1/3}$. Find the cost of installing an extra 9 feet of countertop after 30 feet have already been ordered. 90) _____
- A) $\$45.43$ B) $\$38.75$ C) $\$19.38$ D) $\$241.51$

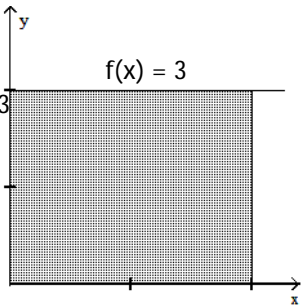
- 91) A company estimates that its sales will grow continuously at a rate given by the function 91) _____
 $S'(t) = 15e^t$,
 where $S'(t)$ is the rate at which sales are increasing, in dollars per day, on day t . Find the sales from the 2nd day through the 8th day. (This is the integral from 1 to 8.)
 A) \$20,866.71 B) \$44,714.37 C) \$44,673.60 D) \$2978.24

- 92) An object moves in such a way that its velocity (in meters per second) after time t (in seconds) is given by 92) _____
 $v = t^2 + 6t + 3$.
 Find the distance traveled by the object during the first four seconds.
 A) 69.3 m B) 43.0 m C) 81.3 m D) 60.0 m

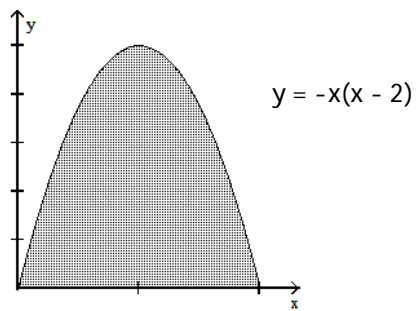
- 93) A particle is released during an experiment. Its speed t minutes after release is given by 93) _____
 $v(t) = -0.25t^2 + 8t$,
 where $v(t)$ is in kilometers per minute. How far does the particle travel during the first 12 minutes?
 A) 60.00 km B) 432.00 km C) 576 km D) 720.00 km

Compute the area of the shaded region.

- 94) 94) _____
- 
- A) 2 B) 32 C) 8 D) 16

- 95) 95) _____
- 
- A) 30 B) 45 C) 15 D) 900

96)



96) _____

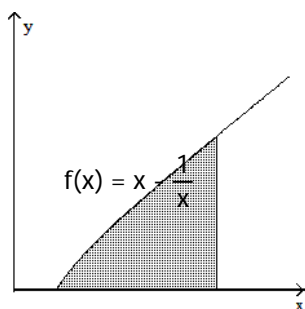
A) $\frac{3}{4}$

B) 1

C) $\frac{1}{3}$

D) $\frac{4}{3}$

97)



97) _____

A) $41 - \ln \frac{1}{9}$

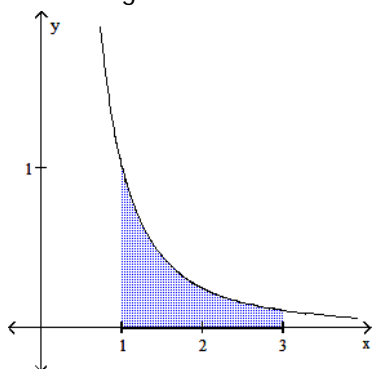
B) $40 - \ln 9$

C) $80 - \ln 9$

D) $40 - \ln \frac{1}{9}$

- 98) Given the graph of the function $y = \frac{1}{x^2}$, set up the definite integral that gives the area of the shaded region.

98) _____



A) $\int_0^3 \frac{1}{x^2} dx$

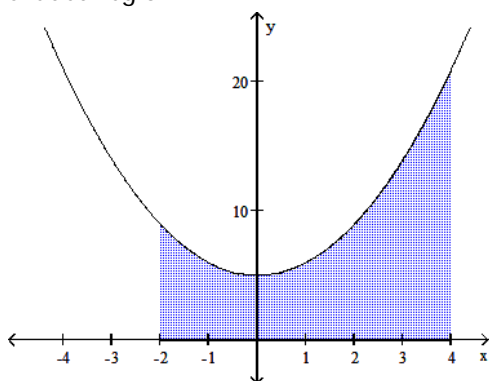
B) $\int_1^3 \frac{1}{x^2} dx$

C) $\int_0^1 \frac{1}{x^2} dx$

D) $\int_0^2 \frac{1}{x^2} dx$

- 99) Given the graph of the function $y = x^2 + 5$, set up the definite integral that gives the area of the shaded region.

99) _____



A) $\int_4^{-2} (x^2 + 5) dx$

B) $\int_0^5 (x^2 + 5) dx$

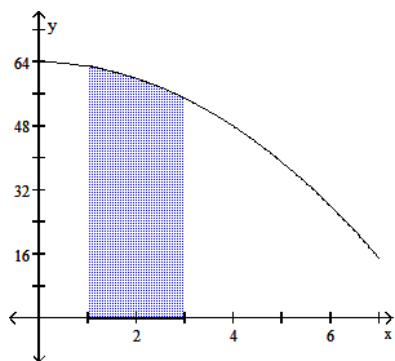
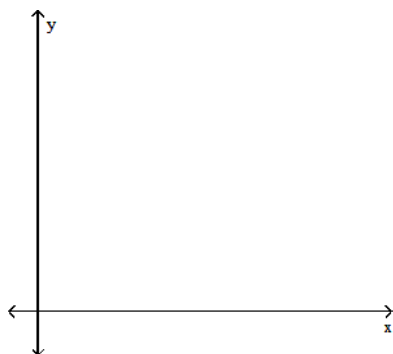
C) $\int_0^4 2(x^2 + 5) dx$

D) $\int_{-2}^4 (x^2 + 5) dx$

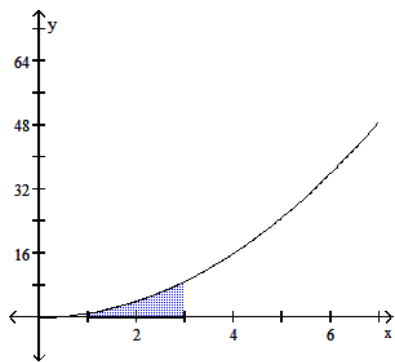
100) Draw the region whose area is given by the definite integral.

100) _____

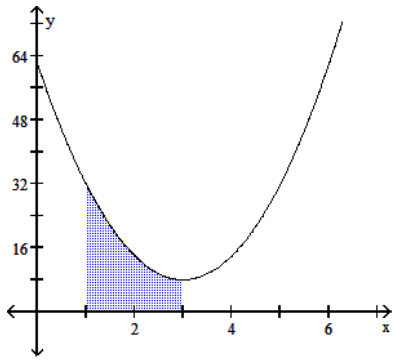
$$\int_1^3 x^2 dx$$



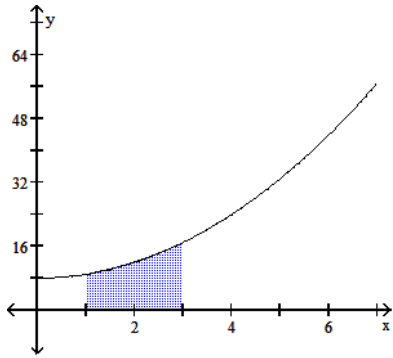
A)



B)



C)

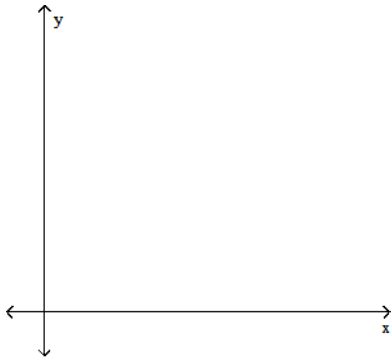


D)

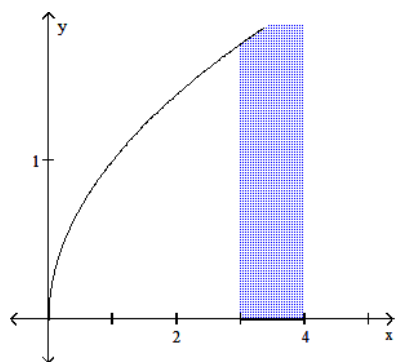
101) Draw the region whose area is given by the definite integral.

101) _____

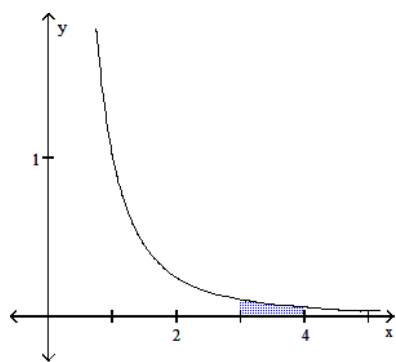
$$\int_3^4 \frac{1}{x^2} dx$$



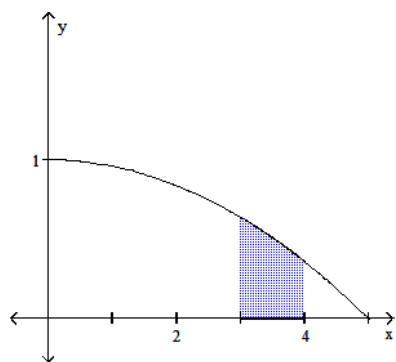
A)



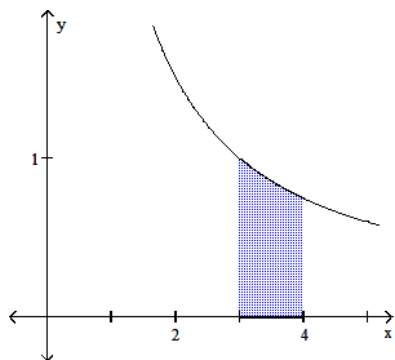
B)



C)



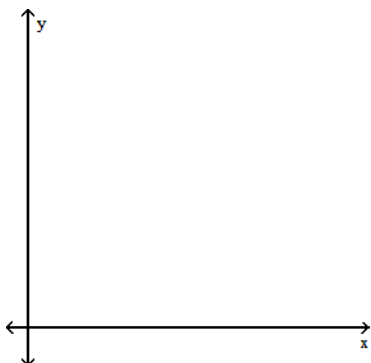
D)



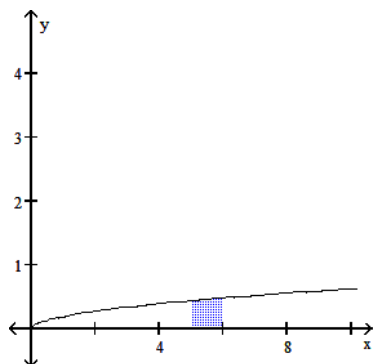
102) Draw the region whose area is given by the definite integral.

$$\int_5^6 \frac{5}{\sqrt{x}} dx$$

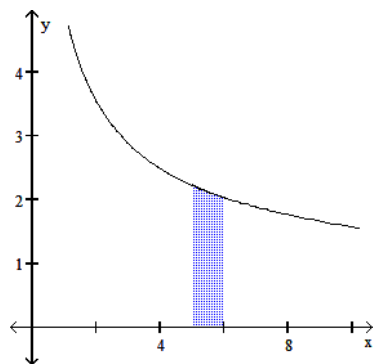
102) _____



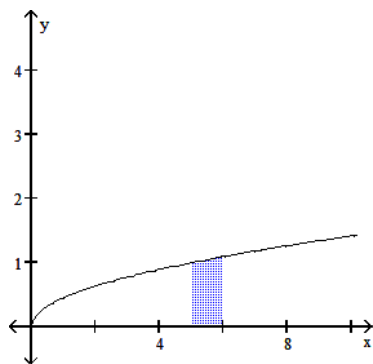
A)



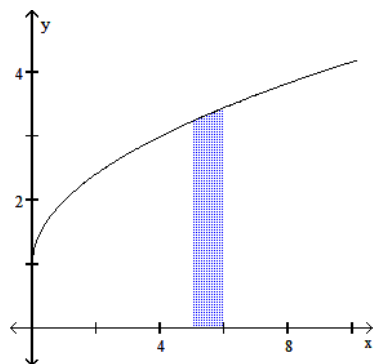
B)



C)



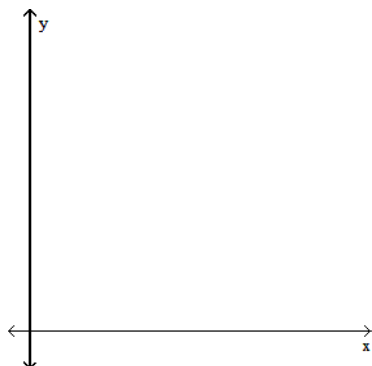
D)



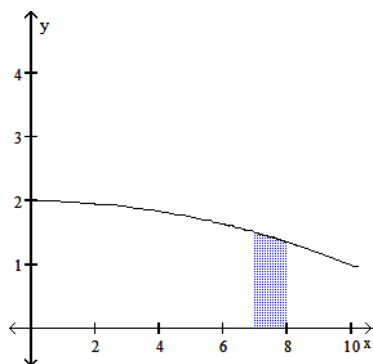
103) Draw the region whose area is given by the definite integral.

$$\int_7^8 \sqrt[5]{x} \, dx$$

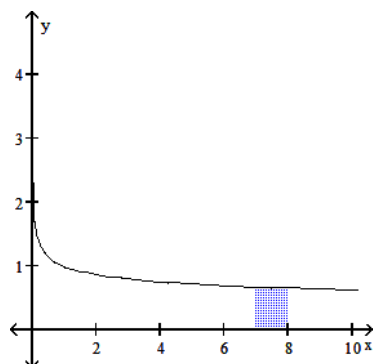
103) _____



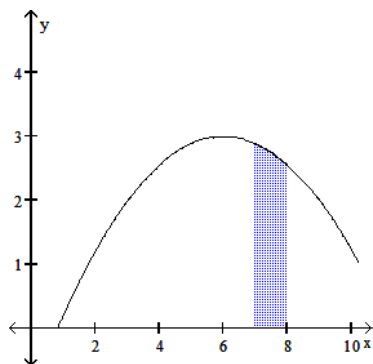
A)



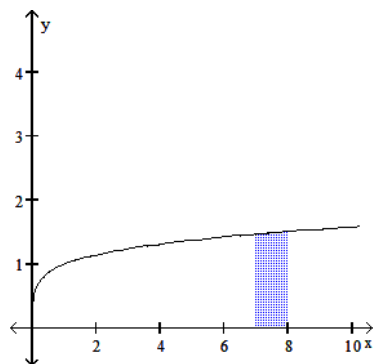
B)



C)



D)



104) What is the area under the curve $f(x) = 3x^2 + 2x + 1$ from $x = -\frac{3}{2}$ to $x = -\frac{1}{2}$?

104) _____

A) $\frac{9}{4}$

B) $\frac{51}{4}$

C) $\frac{15}{4}$

D) $-\frac{15}{4}$

E) none of these

105) What is the area under the curve $y = \frac{2}{x}$ between $x = 1$ and $x = 3$?

105) _____

A) $2 \ln 3 - e$

B) $\ln 9$

C) $\frac{1}{2} \ln 3$

D) $2 \ln 3 - 2$

E) none of these

106) What is the area under the curve $y = \frac{1}{\sqrt{x}}$ between $x = 1$ and $x = 2$?

106) _____

A) $\ln \sqrt{2}$

B) $\frac{\sqrt{2} - 1}{2}$

C) $2\sqrt{2} - 2$

D) $\frac{\ln \sqrt{2}}{\sqrt{2}}$

E) none of these

107) What is the area under the curve $y = x^3 + x$ from $x = 1$ to $x = 2$?

107) _____

A) $\frac{21}{4}$

B) $\frac{6}{4}$

C) $6\frac{1}{4}$

D) $\frac{21}{2}$

E) none of these

108) What is the area under the curve $y = \frac{1}{3} + 3e^{3x}$ between $x = -\frac{1}{3}$ and $x = \frac{1}{3}$?

108) _____

A) $\frac{1}{e} - e$

B) $\frac{2}{9}$

C) $\frac{9e^2 + 2e + 9}{2e}$

D) $e + \frac{1}{e}$

E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

109) Determine the area under the curve $y = 4x + 4$ from $x = 2$ to $x = 3$.
Enter an integer.

109) _____

110) Determine the area under the curve $y = e^{4x}$ from $x = 0$ to $x = 1$.
Enter $a(e^b \pm c)$.

110) _____

111) Determine the area under the curve $y = \frac{1}{x}$ from $x = 1$ to $x = e$.
Enter just an integer.

111) _____

112) Find the area under the curve $y = \frac{1}{x} - 2x$ from $x = -3$ to $x = -2$.

112) _____

Enter $a \pm \ln b$ using reduced fractions of form $\frac{a}{b}$ and integers.

113) Find the area under the curve $y = \frac{1}{e^x} + \frac{1}{x-2}$ between $x = 3$ and $x = 5$.

113) _____

Enter your answer in the form $e^a - e^b + c$ (no approximations).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the area under the curve.

114) $y = e^x$; $x = -9$ to $x = 7$ 114) _____
 A) $e^7 + e^9$ B) $e^7 - e^9$ C) $e^7 - \frac{1}{e^9}$ D) e^{16}

115) Determine Δx formed by partitioning the given interval into n subintervals. 115) _____
 $0 \leq x \leq 3$; $n = 2$
 A) $\Delta x = 3$ B) $\Delta x = -\frac{3}{2}$ C) $\Delta x = \frac{3}{2}$ D) $\Delta x = \frac{2}{3}$

Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval, with selected points as specified.

116) $f(x) = x^2$ from $x = 0$ to $x = 1$, $n = 2$; use midpoints of subintervals 116) _____
 A) .125 B) .75 C) .3145 D) .625

117) $f(x) = e^{-x} + 5$ from $x = -2$ to $x = 2$, $n = 4$; use right endpoints 117) _____
 round the answer to two decimal places
 A) 24.22 B) 31.48 C) 20.54 D) 26.96

118) $f(x) = x^2$, $x = 1$ to $x = 5$, $n = 4$; use left endpoints 118) _____
 A) 30 B) 41 C) 69 D) 54

119) $f(x) = x^2$, $x = 1$ to $x = 5$, $n = 4$; use right endpoints 119) _____
 A) 30 B) 69 C) 41 D) 54

120) $f(x) = x^2$, $x = 2$ to $x = 6$, $n = 4$; use midpoints of subintervals 120) _____
 A) 69 B) 62 C) 86 D) 54

121) Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. Use the left endpoints. 121) _____
 $f(x) = 4x^3$; $0 \leq x \leq 3$, $n = 6$
 A) $\frac{441}{16} = 27.56$ B) $\frac{441}{4} = 110.25$ C) $\frac{225}{16} = 14.06$ D) $\frac{225}{4} = 56.25$

122) Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. Use the right endpoints. 122) _____
 $f(x) = 4x^3$; $0 \leq x \leq 3$, $n = 6$
 A) $\frac{225}{16} = 14.06$ B) $\frac{225}{4} = 56.25$ C) $\frac{441}{16} = 27.56$ D) $\frac{441}{4} = 110.25$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 123) Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. 123) _____
Use the right endpoints.
Enter just an integer.
 $f(x) = 2x + 1$; $1 \leq x \leq 5$, $n = 4$
- 124) Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. 124) _____
Use the right endpoints.
Enter just a real number to two decimal places.
 $f(x) = x^3$; $0 \leq x \leq 2$, $n = 4$
- 125) Use a Riemann sum to approximate the area under the graph of 125) _____
 $f(x) = c$, $-2 \leq x \leq 3$, $n = 6$. Use the left endpoints of the interval.
Enter an unlabeled answer.
- 126) Use a Riemann sum to approximate the area under the graph of $f(x) = x$, $0 \leq x \leq 5$, $n = 10$. 126) _____
Use the right endpoints.
Enter just a real number to two decimal places.
- 127) Use a Riemann sum to approximate the area under the graph of $f(x) = x^3$, $1 \leq x \leq 3$, $n = 4$. 127) _____
Use the midpoints of the intervals.
Enter your answer as just a reduced fraction of form $\frac{a}{b}$.
- 128) Given $f(x) = x^2 + x + 1$ on the interval $0 \leq x \leq 4$ and with $n = 5$, compute the Riemann sum 128) _____
(a) using the left endpoints; (b) using the right endpoints; and (c) using the midpoints of the subintervals. Enter your answer as just a, b, c all integers separated by commas.
Enter the numbers in the order that answers (a), (b), (c) but do not label. Round to the nearest whole number.
- 129) Given $f(x) = x^3 - 1$ on the interval $1 \leq x \leq 5$ and with $n = 4$, compute the Riemann sum (a) 129) _____
using the left endpoints; (b) using the right endpoints; and (c) using the midpoints of the subintervals. Enter your answer as just a, b, c all integers separated by commas.
Enter the numbers in the order that answers (a), (b), (c) but do not label.
- 130) Given $f(x) = \ln x$ on the interval $1 \leq x \leq 5$ and with $n = 2$, compute the Riemann sum (a) 130) _____
using the left endpoints; (b) using the right endpoints; and (c) using the midpoints of the subintervals. Enter your answer as just a, b, c all real numbers rounded to two decimal places and separated by commas.
Enter the numbers in the order that answers (a), (b), (c) but do not label.

- 131) Given $f(x) = e^x + x$; $0 \leq x \leq 2$, $n = 6$, set up a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. Use the left endpoints. Is the following the correct sum?
Enter "yes" or "no".

131) _____

$$\frac{1}{3} \left[1 + \left(e^{1/3} + \frac{1}{3} \right) + \left(e^{2/3} + \frac{2}{3} \right) + (e + 1) + \left(e^{4/3} + \frac{4}{3} \right) + \left(e^{5/3} + \frac{5}{3} \right) \right]$$

- 132) Given $f(x) = \ln(x + 1)$; $0 \leq x \leq 1$, $n = 3$, set up a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval. Use the midpoints. Is the following the correct answer?
Enter "yes" or "no".

132) _____

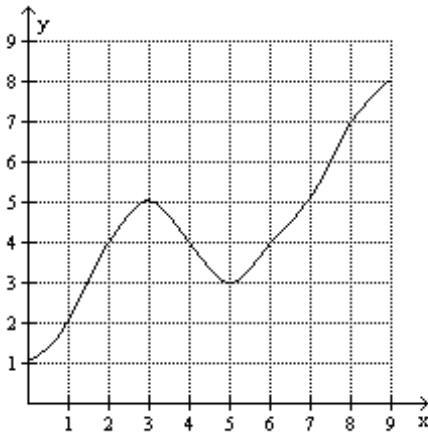
$$\ln\left(\frac{7}{6}\right) + \ln\left(\frac{3}{2}\right) + \ln\left(\frac{11}{6}\right)$$

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

- 133) Use a Riemann sum to approximate the area under the graph of $f(x)$ on the given interval with selected points as specified.
 $1 \leq x \leq 7$; $n = 6$; right endpoints

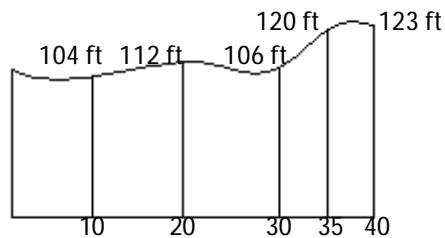
133) _____



- A) 21 B) 25 C) 27 D) 20

- 134) Estimate the area (in square feet) of the residential lot.

134) _____



- A) 4435 sq. ft. B) 3915 sq. ft. C) 4610 sq. ft. D) 4450 sq. ft.

135) Set up an integral or sum of integrals and then find the area bounded by $y = x^2 + 3$ and $y = -5x - 3$. 135) _____

A) $\int_2^3 [(x^2 + 3) - (-5x - 3)] dx = \frac{149}{6}$

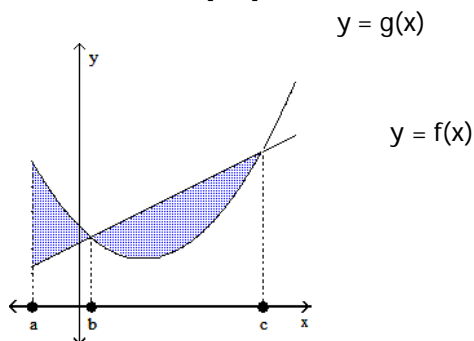
B) $\int_{-3}^{-2} [(-5x - 3) - (x^2 + 3)] dx = \frac{1}{6}$

C) $\int_2^3 [(-5x - 3) - (x^2 + 3)] dx = -\frac{149}{6}$

D) $\int_{-3}^{-2} [(x^2 + 3) - (-5x - 3)] dx = -\frac{1}{6}$

E) none of these

136) Set up a definite integral or sum of definite integrals that represent the indicated shaded areas over the interval $[a, c]$. 136) _____



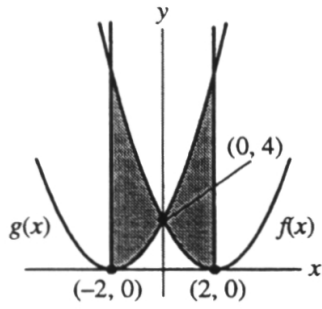
A) $\int_a^b [f(x) - g(x)] dx + \int_b^c [g(x) - f(x)] dx$

B) $\int_a^c [f(x) - g(x)] dx$

C) $\int_b^a [f(x) - g(x)] dx + \int_b^c [g(x) - f(x)] dx$

D) $\int_a^b [g(x) - f(x)] dx + \int_b^c [f(x) - g(x)] dx$

- 137) Refer to the information in the graph below. Given functions $f(x) = x^2 + 4x + 4$ and $g(x) = x^2 - 4x + 4$, set up a definite integral or sum of definite integrals that gives the area of the shaded portion. 137) _____

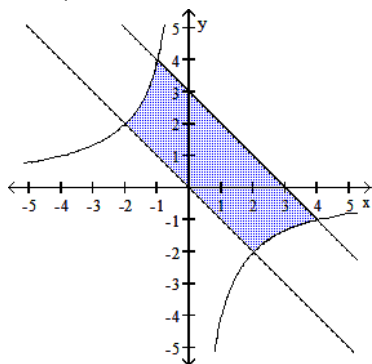


- A) $\int_{-2}^0 -8x \, dx + \int_0^2 8x \, dx$
- B) $\int_{-2}^2 [(x^2 - 4x + 4) - (x^2 + 4x + 4)] \, dx$
- C) $\int_{-2}^0 8x \, dx + \int_0^2 -8x \, dx$
- D) $\int_{-2}^{-4} [(x^2 - 4x + 4) - (x^2 + 4x + 4)] \, dx$
- E) none of these

138) In the figure below, the region enclosed by the curves $y = -\frac{4}{x}$, $y = -x$, and $y = -x + 3$ is shown.

138) _____

Set up an integral or sum of integrals to find the area of the shaded region. (Do not calculate the area.)



A) $\int_{-2}^{-1} \left(-\frac{4}{x} + x \right) dx + \int_{-1}^2 3 dx + \int_2^4 \left(-x + 3 + \frac{4}{x} \right) dx$

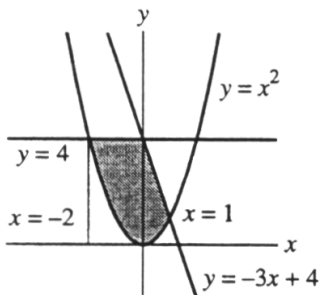
B) $\int_{-2}^2 3 dx + \int_2^4 \left(-x + 3 - \frac{4}{x} \right) dx$

C) $\int_{-2}^0 \left(-\frac{4}{x} + x \right) dx + \int_0^2 \left(-x + 3 + \frac{4}{x} \right) dx$

D) $\int_{-2}^4 3 dx$

E) none of these

- 139) Refer to the information in the graph below. Set up a definite integral or sum of definite integrals that gives the area of the shaded portion. 139) _____



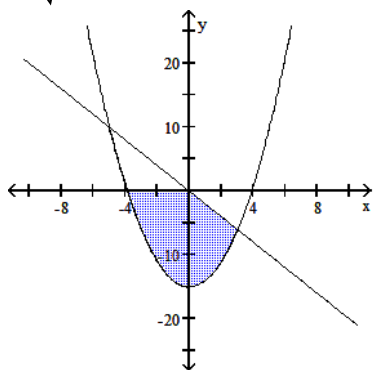
- A) $\int_{-2}^0 (4 - x^2) dx + \int_0^1 (-3x + 4 - x^2) dx$
 B) $\int_{-2}^0 (4 - x^2) dx + \int_0^1 [4 - (-3x + 4)] dx$
 C) $\int_{-2}^1 [4 + (-3x + 4) - x^2] dx$
 D) $\int_{-2}^{-3x+4} (4 - x^2) dx$
 E) none of these

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 140) This is a sketch of the region between the two curves $y = x^2 - 15$, below the x -axis and also below the line $y = -2x$. Does the following represent the area of the region?

140) _____

$$\int_{-\sqrt{15}}^0 (x^2 - 15) dx + \int_0^3 (-x^2 - 2x + 15) dx$$

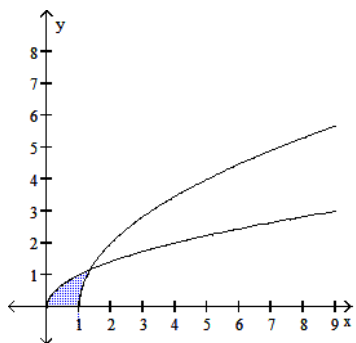


Enter just "yes" or "no".

- 141) This is a sketch of the region between the two curves $y = \sqrt{x}$ and $y = 2\sqrt{x-1}$ and the x-axis. Does the following represent the area of the region?

141) _____

$$\int_0^1 \sqrt{x} \, dx + \int_1^{4/3} \sqrt{x} - 2\sqrt{x-1} \, dx$$

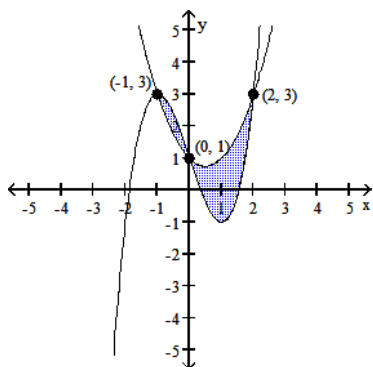


Enter just "yes" or "no".

- 142) This is a sketch of the region between the two curves $y = x^3 - 3x + 1$ and $y = x^2 - x + 1$. Does the following represent the area of the region?

142) _____

$$\int_{-1}^0 (x^3 - x^2 - 2x) \, dx + \int_0^2 (-x^3 + x^2 + 2x) \, dx$$



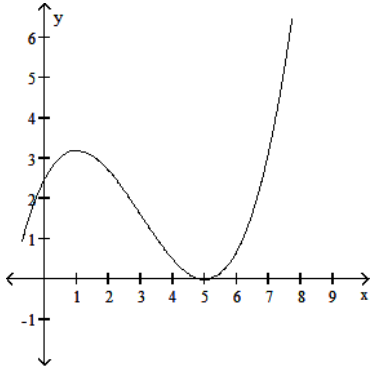
Enter just "yes" or "no".

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Let $f(x)$ be the function pictured in the graph. Determine whether the given integral is positive, negative, or zero.

143) $\int_0^6 f(x) dx$

143) _____



A) Negative

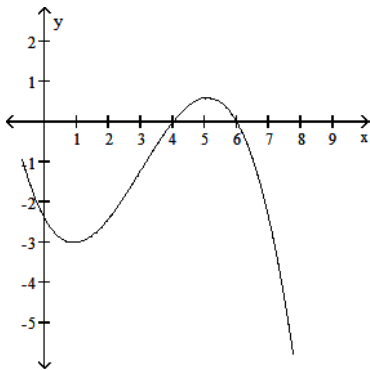
B) Positive

C) Cannot be determined

D) Zero

144) $\int_0^6 f(x) dx$

144) _____



A) Zero

B) Negative

C) Cannot be determined

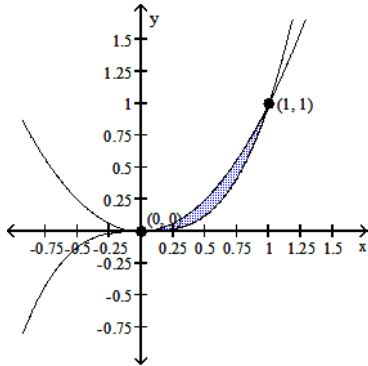
D) Positive

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 145) This is a sketch of the region between the two curves $f(x) = x^2$, $g(x) = x^3$. Compute the area.

145) _____

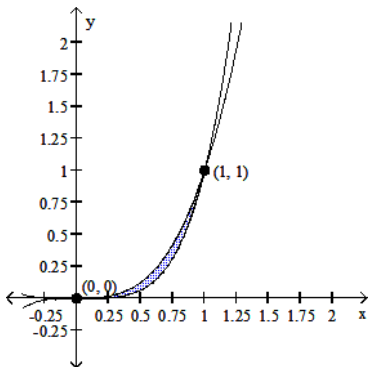
Enter your answer as just a reduced fraction of form $\frac{a}{b}$.



- 146) This is a sketch of the region between the two curves $f(x) = x^3$, $g(x) = x^4$. Compute this area.

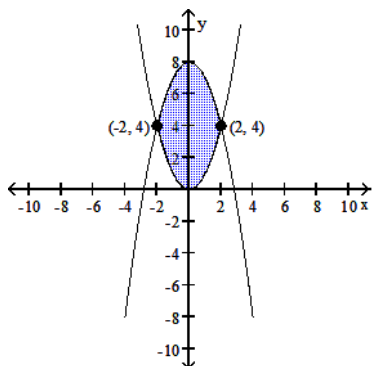
146) _____

Enter your answer as just a reduced fraction of form $\frac{a}{b}$.



- 147) This is a sketch of the region between the two curves $f(x) = x^2$, $g(x) = 8 - x^2$. Compute this area.

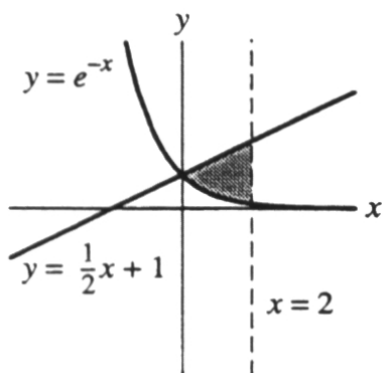
Enter just a reduced fraction of form $\frac{a}{b}$.



147) _____

- 148) Use the graph below to determine the area of the shaded region.

Enter your answer exactly in the form $a \pm e^b$.



148) _____

- 149) Find the area of the region bounded by the curve $f(x) = 5x - 2x^2$ and the line $y = 3$.

Enter just a reduced fraction of form $\frac{a}{b}$.

149) _____

- 150) Find the area of the region bounded by the curve $f(x) = x^2$ and the line $y = x$.

Enter just a reduced fraction of form $\frac{a}{b}$.

150) _____

- 151) Find the area of the region bounded by $f(x) = \{x^2(0 \leq x \leq 1); 2x - x^2(1 \leq x \leq 2)\}$ and the line $y = 0$.

Enter just an integer.

151) _____

- 152) Find the area of the region bounded by the curve $y = -x^2 + 3$ and the line $y = 2x$. 152) _____
Enter just a reduced fraction of form $\frac{a}{b}$.
- 153) Find the area of the region bounded by the curves $y = x^2 + \frac{8}{5}x + 1$ and $y = \frac{2}{5}x + 1$. 153) _____
Enter just a reduced fraction of form $\frac{a}{b}$.
- 154) Find the area of the region bounded by $y = x$ and $y = x^3$. 154) _____
Enter a reduced fraction $\frac{a}{b}$.
- 155) Find the area of the region bounded by $y = 6x - x^2$ and $y = x^2 - 2x$. 155) _____
Enter a reduced fraction of form $\frac{a}{b}$.
- 156) Find the area of the region bounded by $y = 4x - x^2$ and the x -axis. 156) _____
Enter a reduced fraction of form $\frac{a}{b}$.
- 157) Find the area of the region bounded by $y = 1 - 2x - x^2$ and the lines $x = -1$ and $x = 0$. 157) _____
Enter a reduced fraction of form $\frac{a}{b}$.
- 158) Find the area of the region bounded by $y = e^{-2x}$, the x -axis, and the lines $x = 1$ and $x = 3$. 158) _____
Enter your answer in the form $a(e^b - e^c)$.
- 159) Find the area bounded by $y = \frac{1}{x}$, the x -axis, and the lines $x = 1$ and $x = a > 1$. 159) _____
Enter a real number (no approximations).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

160) Find the area of the region between $y = 3x - 1$, the y -axis, and the lines $y = 2$ and $y = 5$. 160) _____

A) $\frac{9}{2}$

B) $\frac{19}{2}$

C) $\frac{26}{3}$

D) $\frac{17}{2}$

E) none of these

161) Find the area of the region bounded by the curve $y = \left(\frac{1}{2}x + 3\right)^{-1}$, the y -axis, and the line $y = 1$. 161) _____

A) $4 - 2 \ln 3$

B) $\ln 3$

C) $\ln \frac{7}{2} - \ln 3$

D) $2 \left(\ln \frac{7}{2} - \ln 3 \right)$

E) none of these

162) $\int_a^b (f(x) - g(x)) dx$ expresses the area between the curves $y = f(x)$ and $y = g(x)$ from $x = a$ to $x = b$ 162) _____

only if:

A) $f(x)$ and $g(x)$ do not cross each other between $x = a$ and $x = b$.

B) $f(x)$ is greater than or equal to $g(x)$ for all x between a and b .

C) neither $f(x)$ and $g(x)$ cross the x -axis.

D) $f(x)$ is greater than or equal to $g(x)$ for all x between a and b , and neither $f(x)$ nor $g(x)$ crosses the x -axis.

E) none of these

163) Does $\int_1^3 (e^x - 1) dx$ express the area between the curve $y = e^x - 1$ and the x -axis between $x = 1$ 163) _____

and $x = 3$? Give a reason for your answer.

A) Yes, because $y = e^x - 1$ does not cross the x -axis between 1 and 3.

B) No, because $y = e^x - 1$ crosses the x -axis between 1 and 3.

C) No, because $\int_1^3 (e^x - 1) dx$ is negative.

D) Yes, because $y = e^x - 1$ is nonnegative for all x between 1 and 3.

E) none of these

Solve the problem.

- 164) A company has found that its rate of expenditure (in hundreds of dollars) on a certain type of job is given by 164) _____

$$E'(x) = 8x + 7,$$

where x is the number of days since the start of the job. Find the total expenditure if the job takes 8 days.

- A) \$71 B) \$312 C) \$31,200 D) \$7100

- 165) After a new firm starts in business, it finds that its rate of profit (in hundreds of dollars) after t years of operation is given by 165) _____

$$P'(t) = 3t^2 + 2t + 4.$$

Find the profit in year 6 of the operation.

- A) \$17,000 B) \$10,600 C) \$22,300 D) \$26,400

- 166) The velocity of particle A, t seconds after its release is given by 166) _____

$v_A(t) = 9.1t - 0.6t^2$ meters per second. The velocity of particle B, t seconds after its release is given

by $v_B(t) = 10.9t - 0.3t^2$ meters per second. If velocity is measured in meters per second, how much farther does particle B travel than particle A during the first ten seconds (from $t = 0$ to $t = 10$)?

Round to the nearest meter.

- A) 390 m B) 480 m C) 190 m D) 6 m

- 167) The velocity of particle A, t seconds after its release is given by $v_A(t) = 2.8e^{0.5t}$ meters per second. 167) _____

The velocity of particle B, t seconds after its release is given by

$v_B(t) = 13.3t - 0.3t^2$ meters per second. If velocity is measured in meters per second, how much farther does particle A travel than particle B during the first ten seconds (from $t = 0$ to $t = 10$)?

Round to the nearest meter.

- A) 266 m B) 461 m C) 161 m D) 261 m

- 168) In a certain memory experiment, subject A is able to memorize words at a rate given by 168) _____

$$m'(t) = -0.009t^2 + 0.6t \quad (\text{words per minute}).$$

In the same memory experiment, subject B is able to memorize at the rate given by

$$M'(t) = -0.003t^2 + 0.6t \quad (\text{words per minute}).$$

How many more words does subject B memorize from $t = 0$ to $t = 17$ (during the first 17 minutes)?

Round to the nearest word.

- A) 97 words B) 10 words C) 29 words D) 82 words

Determine the average value of $f(x)$ over the interval from $x = a$ to $x = b$.

- 169) $f(x) = e^{-x}$; $a = 0$, $b = 4$ 169) _____

A) $\frac{e^{-4} - 1}{4}$

B) $\frac{1 - e^{-4}}{4}$

C) $1 - e^{-4}$

D) e^{-2}

- 170) $f(x) = e^x$; $a = 0, b = 4$ 170) _____
 A) $\frac{e^4 - 1}{4}$ B) $\frac{e^4 + 1}{4}$ C) $\frac{e^4 + 1}{16}$ D) $e^4 - 1$
- 171) $f(x) = 6x + 1$; $a = 2, b = 5$ 171) _____
 A) 43 B) 6 C) 22 D) 66
- 172) $f(x) = 6 - x^2$; $a = -1, b = 2$ 172) _____
 A) $\frac{11}{9}$ B) 1 C) 5 D) $\frac{47}{9}$
- 173) $f(x) = x + 4$; $a = 1, b = 21$ 173) _____
 A) 26.025 B) 15 C) 15.225 D) 14.286

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 174) Determine the average value of $f(x) = e^{3x}$ over the interval from $x = 1$ to $x = 3$. 174) _____
 Enter your answer in the form $a(e^b \pm e^c)$
- 175) Determine the average value of $f(x) = x^3$ over the interval from $x = 0$ to $x = 4$. 175) _____
 Enter an integer.
- 176) Determine the average value of $f(x) = \frac{1}{x^2}$ over the interval from $x = 1$ to $x = 2$. 176) _____
 Enter a reduced fraction of form $\frac{a}{b}$.
- 177) Determine the average value of $f(x) = \frac{1}{x^2}$ over the interval from $x = 1$ to $x = 100$. 177) _____
 Enter a reduced fraction of form $\frac{a}{b}$.
- 178) Determine the average value of $g(x) = \sqrt{x}$ over the interval from $x = 0$ to $x = 4$. 178) _____
 Enter a reduced fraction of form $\frac{a}{b}$.
- 179) Determine the average value of $f(x) = x - x^2$ over the interval from $x = 0$ to $x = 1$. 179) _____
 Enter a reduced fraction of form $\frac{a}{b}$.
- 180) Determine the average value of $f(x) = e^x$ over the interval from $x = 1$ to $x = 4$. 180) _____
 Enter your answer in the form $a(e^b \pm e)$

181) Determine the average value of $f(x) = x^3 + 3x^2 + 3x + 1$ over the interval from $x = -1$ to $x = 3$. 181) _____
Enter an integer.

182) Suppose that a 1000-L water tank takes 20 min to drain and that after t minutes, the amount of water remaining in the tank is $V(t) = \frac{5}{2}(20 - t^2)$ liters. What is the average amount of water in the tank during the time it drains? 182) _____
Enter a reduced fraction of form $\frac{a}{b}$ (no units)

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

183) Suppose the the profit realized by a department store t days after its opening is given by the formula $4t^3 - 2t + 1$. What was the average profit per day of the store during the first five days? 183) _____
A) \$225
B) \$218
C) \$121
D) \$97.80
E) none of these

184) Suppose that a colony of fruit flies is growing exponentially with growth constant 0.04 . If there are currently 30,000 flies present, what will be the average population over the next 6 months? 184) _____
A) $30,000(e^{0.02} - 1)$
B) $1,500,000(e^{0.02} - 1)$
C) $75,000(e^{0.24} - 1)$
D) $60,000(e^{0.24} - 1)$
E) none of these

185) Suppose the \$2500 is deposited in a savings account paying 5% interest, compounded continuously. What will be the average value of the account during the next 10 years? 185) _____
A) $2500(e^{50} - 1)$
B) $50,000(e^{0.5} - 1)$
C) $250(e^5 - 1)$
D) $50,000(e^{0.05} - 1)$
E) none of these

Solve the problem.

186) The design of an electric power generating station depends on both the peak and the average power that it must produce. If a community uses $336 + 144t - 6t^2$ megawatts at time t (in hours) during the period $t = 0$ to $t = 24$, find the average level of power consumption for that day. 186) _____
A) 21,888 MW B) 912 MW C) 2064 MW D) 49,536 MW

187) A certain commodity has demand curve $p = \frac{20}{x+5} - 1$ at sales level x . What is the consumers' surplus if 5 units are currently being sold? 187) _____

A) $20(\ln 10) - 10$
 B) $20(\ln 15 - \ln 5) - 10$
 C) $\frac{1}{20}(\ln 3) - 20$
 D) $20(\ln 15 + \ln 5) - 10$
 E) none of these

188) What is the consumers' surplus for the demand curve $p = 5 - \frac{x}{20}$ at the sales level $x = 60$? 188) _____

A) 291
 B) 90
 C) $320 - \frac{1}{20} \ln 60$
 D) $200 - 20 \ln 60$
 E) none of these

189) Find the producers' surplus for the supply curve $p = 0.02x + 7$ at $x = 100$. 189) _____

A) \$100 B) \$200 C) \$900 D) \$800

190) Find the producers' surplus for the supply curve $p = 4 + \frac{1}{2}\sqrt{x}$ at $x = 144$. 190) _____

A) \$392 B) \$724 C) \$1152 D) \$288

Find the consumer surplus for the demand curve at the given sales level, x .

191) $p = 2x + 5$; $x = 0$ 191) _____

A) \$2 B) \$5 C) \$0 D) \$7

192) $p = 3 - 4x$; $x = 1$ 192) _____

A) \$0 B) \$4 C) \$8 D) \$2

Find the producer surplus for the supply curve at the given sales level, x .

193) $p = 3 - x$; $x = 0$ 193) _____

A) \$1.75 B) \$2.30 C) \$1 D) \$0

194) $p = 1 - 5x$; $x = 1$ 194) _____

A) \$5 B) -\$2.50 C) -\$4 D) \$0.20

195) $p = 2x^2$; $x = 1$ 195) _____

A) \$1.33 B) \$4 C) \$0.67 D) \$1

- 196) $p = x^2$; $x = 4$ 196) _____
 A) \$2.67 B) \$12 C) \$42.67 D) \$64
- 197) $p = x^2 + 1$; $x = 1$ 197) _____
 A) \$1 B) -\$1 C) \$0.67 D) -\$0.33

For a particular commodity, the quantity produced and the unit price are given by the coordinates of the point where the supply and demand curves intersect. Determine the point of intersection for the following supply and demand curves.

- 198) Demand curve: $p = -3x + 7$, Supply curve: $p = 4x + 1$ 198) _____
 A) $\left(-\frac{1}{3}, \$1.04\right)$ B) $(-3, \$16)$ C) $\left(\frac{6}{7}, \$4.43\right)$ D) $(4, \$-5)$
- 199) Demand curve: $p = 9 - 10x$, Supply curve: $p = 1 + 10x$ 199) _____
 A) $\left(-\frac{2}{5}, -\$3.00\right)$ B) $\left(\frac{2}{5}, \$41.00\right)$ C) $(4, \$41.00)$ D) $\left(\frac{2}{5}, \$5.00\right)$

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 200) Suppose that money is deposited in a savings account at a steady rate of \$150 per month. 200) _____
 If the account pays 2.5% interest compounded continuously, how much will be in the account at the end of 3 years? Enter your answer in the form $a(e^b \pm c)$ where b is a real number to three decimal places (no units).

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Solve the problem.

- 201) Find the future value of an investment in which money is deposited steadily so that \$400 per year is being invested at 6%, compounded continuously for 20 years. 201) _____
 A) \$28,800.78 B) \$15,467.45 C) \$22,134.11 D) \$92,804.68
- 202) Find the future value of an investment in which money is deposited steadily so that \$1000 per year is being invested at 5.5%, compounded continuously for 40 years. 202) _____
 A) \$802,501.35 B) \$164,091.15 C) \$182,272.97 D) \$145,909.34
- 203) Calculate the present value of a continuous income stream of \$500 per year for 10 years at an interest rate of 4% compounded continuously. 203) _____
 A) \$8379.00 B) \$4121.00 C) \$20,879.00 D) \$6147.81

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

- 204) A region is bounded above by the graph of $y = x^{-2}$ and below by the x-axis on the interval from $x = 1$ to $x = 3$. Find the volume of the solid of revolution generated by revolving the region about the x-axis. 204) _____

Enter your answer as a reduced quotient of form $\frac{ab}{c}$.

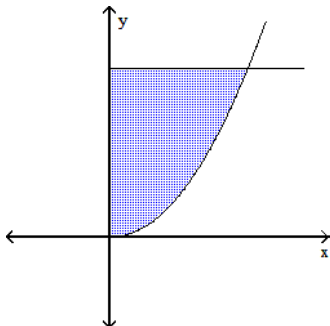
- 205) A region is bounded by the graph of $y = x^3$, the y-axis, and the horizontal line $y = 1$. Find the volume of the solid of revolution generated by revolving the region about the x-axis. 205) _____

Enter your answer as a reduced quotient in form $\frac{ab}{c}$.

- 206) A region is bounded above by the graph of $y = x - x^3$ and below by the x-axis on the interval from $x = 0$ to $x = 1$. Find the volume of the solid of revolution generated by revolving the region about the x-axis. Enter your answer as a reduced quotient of form $\frac{ab}{c}$. 206) _____

- 207) Find the volume of the solid of revolution generated by revolving the region formed by the graphs of $y = x^2$, $y = 2$, and $x = 0$ about the x-axis. 207) _____

Enter a reduced quotient $\frac{ab\sqrt{c}}{d}$.



MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

Find the volume generated by revolving about the x-axis the region bounded by the following graph.

- 208) $y = x$, $x = 2$, $x = 4$ 208) _____
- A) 6π B) $\frac{2}{3}\pi$ C) 10π D) $\frac{56}{3}\pi$

209) $y = \sqrt{x}$, $x = 0$, $x = 4$ 209) _____
 A) $\frac{16}{3}\pi$ B) 8π C) 4π D) 2π

210) $y = x^2$, $x = 0$, $x = 5$ 210) _____
 A) $\frac{625}{4}\pi$ B) $\frac{125}{3}\pi$ C) 625π D) $\frac{3125}{4}\pi$

211) $y = e^x$, $x = -2$, $x = 2$ 211) _____
 A) $\frac{\pi}{2}(e^2 - e^{-2})$ B) $\pi(e^4 - e^{-4})$ C) $\frac{\pi}{2}(e^4 - e^{-4})$ D) $\pi^2(e^2 - e^{-2})$

212) $y = x + 2$, $x = -2$, $x = 4$ 212) _____
 A) 16π B) 72π C) 36π D) 3π

213) $y = \sqrt{25 - x^2}$, $x = 0$, $x = 5$ 213) _____
 A) $\frac{500}{3}\pi$ B) $\frac{250}{3}\pi$ C) 10π D) 100π

SHORT ANSWER. Write the word or phrase that best completes each statement or answers the question.

214) For the Riemann sum, $[5\sqrt{1.4} + 5\sqrt{1.8} + 5\sqrt{2.2} + 5\sqrt{2.6} + 5\sqrt{3}](0.4)$; $a = 1$, determine n , b , and $f(x)$. 214) _____
 Enter your answer as just n , b , $f(x)$ (2 integers in that order separated by commas and followed by a power function in x).

215) For the Riemann sum, $[(3.5)^4 + 7(3.5) + (4)^4 + 7(4) + (4.5)^4 + 7(4.5) + (5)^4 + 7(5)](0.5)$; $a = 3$, find n , b , and $f(x)$. 215) _____
 Enter your answer as just n , b , $f(x)$ (2 integers in that order separated by commas and followed by a polynomial in x).

Answer Key

Testname: UNTITLED6

- 1) B
- 2) B
- 3) $-2e^{-x/2} + C$
- 4) $\frac{1}{4}x^4 + C$
- 5) $\frac{1}{5}y^5 + C$
- 6) $\frac{1}{6}x^6 + C$
- 7) $\frac{1}{16}x^{16} + C$
- 8) A
- 9) D
- 10) D
- 11) $\frac{8}{5}x^{5/2} + x^{-1/2} + C$
- 12) $\frac{4}{3}x^3 + 2x^2 + x + C$
- 13) $3x^3 + 6x^2 + 4x + C$
- 14) $\frac{1}{4}x^4 + x + C$
- 15) $\frac{5}{4}x^{4/5} + C$
- 16) $-x^{-1} + x + C$
- 17) $-e^{-2x} + C$
- 18) $-\frac{1}{3}e^{-3x} + C$
- 19) $\frac{2}{5}x^5 + \frac{3}{2}x^2 - 4x + C$
- 20) $x - 7 \ln|x| + C$
- 21) $\frac{2}{3}x^{3/2} + 2x^{1/2} + C$
- 22) $\frac{9}{4}x^{4/3} + C$
- 23) $-6e^{x/2} - 3x + C$
- 24) $\frac{1}{3}x^3 - \frac{1}{4}\ln|x| + C$
- 25) A
- 26) B
- 27) A
- 28) B
- 29) B
- 30) C

Answer Key

Testname: UNTITLED6

31) D

32) $\frac{1}{6}x^6 + \frac{1}{2}x^4 - x^3 + 6x + C$

33) $x^3 + x^2 + x + C$

34) E

35) A

36) D

37) B

38) D

39) B

40) B

41) A

42) C

43) 17.3

44) 324

45) B

46) A

47) C

48) A

49) A

50) D

51) A

52) A

53) B

54) B

55) $\frac{14}{3}$

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

57) $-\frac{5}{2}$

58) $\frac{3}{2}(-1 + e^4)$

59) $\frac{15}{2}$

60) 16

61) $\ln 9$

62) 0

63) $\frac{442}{3}$

64) $\frac{39}{10}$

65) 14

Answer Key

Testname: UNTITLED6

66) $\frac{1}{5}(e^{25} - e^{15})$

67) $\frac{1}{4}(e^{20} - e^8) + \ln \frac{2}{5}$

68) A

69) A

70) C

71) D

72) C

73) C

74) B

75) B

76) A

77) C

78) D

79) A

80) C

81) C

82) B

83) B

84) D

85) D

86) E

87) $20,000(1 - e^{-0.1})$

88) $5000(e^{0.1} - 1)$

89) A

90) C

91) C

92) C

93) B

94) D

95) A

96) D

97) B

98) B

99) D

100) B

101) B

102) B

103) D

104) A

105) B

Answer Key

Testname: UNTITLED6

106) C

107) A

108) E

109) 14

110) $\frac{1}{4}(e^4 - 1)$

111) 1

112) $5 - \ln \frac{3}{2}$

113) $e^{-3} - e^{-5} + \ln 3$

114) C

115) C

116) C

117) A

118) A

119) D

120) A

121) D

122) D

123) 32

124) 6.25

125) 5c

126) 13.75

127) $\frac{79}{4}$

128) 26, 42, 33

129) 96, 220, 149

130) 2.20, 5.42, 4.16

131) yes

132) no

133) B

134) A

135) B

136) D

137) C

138) A

139) A

140) no

141) yes

142) yes

143) B

144) B

Answer Key

Testname: UNTITLED6

145) $\frac{1}{12}$

146) $\frac{1}{20}$

147) $\frac{64}{3}$

148) $2 + e^{-2}$

149) $\frac{1}{24}$

150) $\frac{1}{6}$

151) 1

152) $\frac{32}{3}$

153) $\frac{36}{125}$

154) $\frac{1}{2}$

155) $\frac{64}{3}$

156) $\frac{32}{3}$

157) $\frac{5}{3}$

158) $-\frac{1}{2}(e^{-6} - e^{-2})$

159) $\ln a$

160) A

161) A

162) B

163) D

164) C

165) B

166) C

167) D

168) B

169) B

170) A

171) C

172) C

173) B

174) $\frac{1}{6}(e^9 - e^3)$

175) 16

Answer Key

Testname: UNTITLED6

176) $\frac{1}{2}$

177) $\frac{1}{100}$

178) $\frac{4}{3}$

179) $\frac{1}{6}$

180) $\frac{1}{3}(e^4 - e)$

181) 16

182) $\frac{1000}{3}$

183) C

184) B

185) E

186) B

187) E

188) B

189) A

190) D

191) C

192) D

193) D

194) B

195) A

196) C

197) C

198) C

199) D

200) $72,000(e^{0.075} - 1)$

201) B

202) D

203) B

204) $\frac{26\pi}{81}$

205) $\frac{6\pi}{7}$

206) $\frac{8\pi}{105}$

207) $\frac{16\pi\sqrt{2}}{5}$

208) D

Answer Key

Testname: UNTITLED6

209) B

210) C

211) C

212) B

213) B

214) 5, 3, $5x^{1/2}$

215) 4, 5, $x^4 + 7x$