Philip Dumaresq **D**

WeBWorK assignment due : 04/12/2019 at 11:59pm EDT.

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1. (1 point) You are given the four points in the plane $A=(4,8)$, $B=(8,-5)$, $C=(10,1)$, and $D=(13,-3)$. The graph of the function $f(x)$ consists of the three line segments AB, BC and CD. Find the integral $\int_4^{13} f(x)\,dx$ by interpreting the integral in terms of sums and/or differences of areas of elementary figures.

$\int_4^{13} f(x)\,dx =$ ________

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2. (1 point) Use the Midpoint Rule to approximate

$$\int_{-1.5}^{4.5} x^3 dx$$

with $n=6$.

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3. (1 point) Use the Midpoint Rule to approximate the integral

$$\int_2^{10} (5x+7x^2)dx$$

with n=3.

______

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4. (1 point) Consider the function $f(x)=\frac{x^2}{4}+8$.

In this problem you will calculate $\int_0^4 \left(\frac{x^2}{4}+8\right) dx$ by using the definition

$$\int_a^b f(x)\,dx = \lim_{n\to\infty}\left[\sum_{i=1}^{n} f(x_i)\Delta x\right]$$

The summation inside the brackets is R_n which is the Riemann sum where the sample points are chosen to be the right-hand endpoints of each sub-interval.

Calculate R_n for $f(x)=\frac{x^2}{4}+8$ on the interval $[0,4]$ and write your answer as a function of n without any summation signs. You will need the summation formulas on page 383 of your textbook (page 364 in older texts).

$R_n =$ ____________________

$\lim_{n\to\infty} R_n =$ ____________

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5. (1 point) Let $\int_5^{14} f(x)dx = 10$, $\int_5^{8} f(x)dx = 7$, $\int_{11}^{14} f(x)dx = 3$.

Find $\int_8^{11} f(x)dx =$ ____

and $\int_{11}^{8} (10f(x)-7)dx =$ ____

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6. (1 point) Use the Midpoint Rule to approximate

$$\int_{-1.5}^{4.5} x^3 dx$$

with $n=6$.

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7. (1 point) Use the Midpoint Rule to approximate the integral

$$\int_6^{13} (-10x-8x^2)dx$$

with n=3.

______

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8. (1 point)

(a) By reading values from the given graph of *f*, use five rectangles to find a lower estimate and an upper estimate for the area under the given graph of *f* from $x = 0$ to $x = 10$.

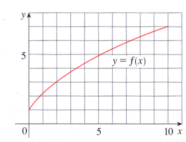
Lower estimate ≈ __________

Upper estimate ≈ __________

(b) Repeat part (a) with 10 rectangles in each case.

Lower estimate ≈ __________

Upper estimate ≈ __________



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9. (1 point)

The speed of a runner increased steadily during the first three seconds of a race. Her speed at half-second intervals is given in the following table:

t (s)	0	0.5	1.0	1.5	2.0	2.5	3.0
v (ft/s)	0	6.2	10.8	14.9	18.1	19.4	20.2

Find lower and upper estimates for the distance (in feet) that she traveled during these three seconds.

Lower estimate = ________ feet

Upper estimate = ________ feet

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10. (1 point)

Definition: The AREA A of the region S that lies under the graph of the continuous function f is the limit of the sum of the areas of approximating rectangles

$$A=\lim_{n\to\infty} R_n = \lim_{n\to\infty}[f(x_1)\Delta x + f(x_2)\Delta x + \ldots + f(x_n)\Delta x]$$

Consider the function $f(x) = \dfrac{\ln(x)}{x}, \quad 3 \le x \le 10$. Using the above definition, determine which of the following expressions represents the area under the graph of f as a limit.

- A. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{\ln(3+\frac{7i}{n})}{3+\frac{7i}{n}}$
- B. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{7}{n}\dfrac{\ln(\frac{7i}{n})}{\frac{7i}{n}}$
- C. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{7}{n}\dfrac{\ln(3+\frac{7i}{n})}{3+\frac{7i}{n}}$
- D. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{10}{n}\dfrac{\ln(\frac{10i}{n})}{\frac{10i}{n}}$
- E. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{10}{n}\dfrac{\ln(3+\frac{10i}{n})}{3+\frac{10i}{n}}$

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11. (1 point)
Definition: The AREA A of the region S that lies under the graph of the continuous function f is the limit of the sum of the areas of approximating rectangles

$$A = \lim_{n\to\infty} R_n = \lim_{n\to\infty}[f(x_1)\Delta x + f(x_2)\Delta x + \ldots + f(x_n)\Delta x]$$

Consider the function $f(x) = x\cos(x), \quad 0 \le x \le \pi/2$. Using the above definition, determine which of the following expressions represents the area under the graph of f as a limit.

- A. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \left(\dfrac{\pi i}{2n}\cos\left(\dfrac{\pi i}{2n}\right)\right)$
- B. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{\pi}{2n}\left(\dfrac{\pi i}{2n}\cos\left(\dfrac{\pi i}{2n}\right)\right)$
- C. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{\pi}{2n}\left(\dfrac{\pi}{2n}\cos\left(\dfrac{\pi}{2n}\right)\right)$
- D. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{\pi i}{2n}\left(\dfrac{\pi i}{2n}\cos\left(\dfrac{\pi i}{2n}\right)\right)$
- E. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n} \dfrac{\pi}{2n}\left(\cos\left(\dfrac{\pi i}{2n}\right)\right)$

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12. (1 point)
Determine which of the following regions has an area equal to the given limit without evaluating the limit:

$$\lim_{n\to\infty}\sum_{i=1}^{n}\frac{2}{n}\left(5+\frac{2i}{n}\right)^{10}$$

- A. The area of the region under the graph of $y = x^5$ on the interval [5, 7].
- B. The area of the region under the graph of $y = x^{10}$ on the interval [2, 5].
- C. The area of the region under the graph of $y = x^5$ on the interval [2, 5].
- D. The area of the region under the graph of $y = x^{10}$ on the interval [5, 7].

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13. (1 point)
Definition: The AREA A of the region S that lies under the graph of the continuous function f is the limit of the sum of the areas of approximating rectangles

$$A = \lim_{n\to\infty} R_n = \lim_{n\to\infty}[f(x_1)\Delta x + f(x_2)\Delta x + \ldots + f(x_n)\Delta x]$$

(a) Use the above Definition to determine which of the following expressions represents the area under the graph of $f(x) = x^3$ from x = 0 to x = 1.

- A. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n}\left(\dfrac{i}{n}\right)^3\dfrac{5}{n}$
- B. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n}\left(\dfrac{i}{n}\right)\dfrac{1}{n}$
- C. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n}\left(\dfrac{i}{n}\right)\dfrac{5}{n}$
- D. $\lim\limits_{n\to\infty}\sum\limits_{i=1}^{n}\left(\dfrac{i}{n}\right)^3\dfrac{1}{n}$

(b) Evaluate the limit that is the correct answer to part (a). You may find the following formula for the sum of cubes helpful:

$$1^3+2^3+3^3+\ldots+n^3 = \sum_{i=1}^{n} i^3 = \left(\frac{n(n+1)}{2}\right)^2.$$

Value of limit = ______________

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14. (1 point) Estimate $\int_{-2}^{2} 4-x^2\,dx$ using left endpoints for $n=4$ approximating rectangles.

$\int_{-2}^{2} 4-x^2\,dx$ is approximately ______________________

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15. (1 point) Estimate $\int_{-2}^{2} 4-x^2\,dx$ using midpoints for $n=4$ approximating rectangles.

$\int_{-2}^{2} 4-x^2\,dx$ is approximately ______________________

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16. (1 point) Estimate $\int_{0}^{4} x^2\,dx$ using left endpoints for $n=4$ approximating rectangles.

$\int_{0}^{4} x^2\,dx$ is approximately ______________________

17. (1 point) Find the numerical value of the sum below.
$\sum_{j=2}^{7}(3j-2) =$ ______________

18. (1 point) Find the numerical value of the sum below.
$\sum_{i=3}^{5}(i^2-i) =$ ______________

19. (1 point) Express the following sum in closed form.
$\sum_{k=1}^{n}(2+2k)^2 =$ ______________________
Hint: Start by multiplying out $(2+2k)^2$.
Note: Your answer should be in terms of n.

20. (1 point) Evaluate the definite integral:

$\int_1^{3.5} 2x^{-1}\,dx =$ ________________

21. (1 point) Evaluate the definite integral:

$\int_1^{6} \left(5-3x^{-3}\right)\,dx =$ ________________

22. (1 point) If $f(x) = \int_x^{x^2} t^2 dt$
then
$f'(x) =$ _________
$f'(-2) =$ _________

23. (1 point) Given

$$f(x) = \int_0^x \frac{t^2-36}{1+\cos^2(t)}dt$$

At what value of x does the local max of $f(x)$ occur?
$x =$ _________

24. (1 point) Use the Fundamental Theorem of Calculus to evaluate the definite integral.
$\int_{-4}^{4} x^2-2x-5\,dx =$ ______________________

25. (1 point) Use the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_1^x \frac{1}{1+t^2}\,dt.$$

$F'(x) =$ ______________________

26. (1 point) Use the Fundamental Theorem of Calculus to carry out the following differentiation:
$\frac{\mathrm{d}}{\mathrm{d}x}\int_1^{\sqrt{x}} t^t \mathrm{d}t =$ __________.

27. (1 point) Calculate the following antiderivatives:
(a) $\int \left(9t-6t^9-8\right)dt =$ __________________ $+C$.
(b) $\int \left(\frac{1}{u^{9/4}}+5\sqrt{u}\right)du =$ __________________ $+C$.
(c) $\int \left(\frac{1}{7x^3}\right)dx =$ __________________ $+C$.

28. (1 point)
Evaluate the integral

$$\int_0^9 \sqrt{4t}\,dt$$

Integral = ______________

29. (1 point)
Evaluate the integral

$$\int_1^9 \frac{-6x-4}{\sqrt{x}}\,dx$$

Integral = ______________

30. (1 point)
Evaluate the integral

$$\int_0^{\pi/4} \frac{-7-7\cos^2(x)}{\cos^2(x)}\,dx$$

Integral = ______________

31. (1 point)
Evaluate the integral

$$\int_4^9 \left(2\sqrt{x}+\frac{1}{\sqrt{x}}\right)^2 dx$$

Integral = ______________

32. (1 point) Calculate the following antiderivatives:
(a) $\int x^3\,dx =$ ___________ $+C$.
(b) $\int x^{4/7}\,dx =$ ___________ $+C$.
(c) $\int x^{-6}\sqrt{x}\,dx =$ ___________ $+C$.

33. (1 point) Calculate the following antiderivatives:
(a) $\int \frac{9}{x}\,dx =$ __________________ $+C$.
(b) $\int -6\sin x+6\cos x\,dx =$ __________________ $+C$.
(c) $\int -10e^x\,dx =$ __________________ $+C$.

34. (1 point) Evaluate the indefinite integral.
$\int \frac{5}{5x^8}+\frac{5x^8}{5}\,dx =$ __________________ $+C$.

35. (1 point) Evaluate the indefinite integral.
$\int 6\sec^2 x-5e^x\,dx =$ __________________ $+C$.

36. (1 point) Use the Fundamental Theorem of Calculus to evaluate the definite integral.

$\int_{-1}^{1} x^2 - x + 1\, dx =$ ______

37. (1 point) Use the Fundamental Theorem of Calculus to evaluate the definite integral.

$\int_{1}^{4} -x\left(x^5+3\right)\, dx =$ ______

38. (1 point) Use the Fundamental Theorem of Calculus to evaluate the definite integral.

$\int_{2}^{3} \frac{3}{x^4}\, dx =$ ______

39. (1 point) Use the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_{4}^{x} t^4\, dt.$$

Then evaluate the derivative at $x = -5$.

1. $F'(x) =$ ______
2. $F'(-5) =$ ______

40. (1 point) Use the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_{1}^{x} \frac{1}{1+t^5}\, dt.$$

$F'(x) =$ ______

41. (1 point) Use the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_{x}^{2} \sin\left(t^4\right)\, dt.$$

$F'(x) =$ ______

42. (1 point) Use the Fundamental Theorem of Calculus to find the derivative of

$$F(x) = \int_{-2}^{\sin x} \cos\left(t^2\right) + t\, dt.$$

$F'(x) =$ ______

43. (1 point)

Find the derivative of $f(x) = x\sin(x) + \cos(x) + C$ to complete the following integration formula:

$\int$ ______ $dx = x\sin(x) + \cos(x) + C$

44. (1 point)

Find the derivative of $f(x) = -\frac{\sqrt{x^2+a^2}}{a^2 x} + C$ to complete the following integration formula:

$\int$ ______ $dx = -\frac{\sqrt{x^2+a^2}}{a^2 x} + C$

45. (1 point)

Using an upper-case ”C” for any arbitrary constants, find the general indefinite integral

$$\int 10x^{-3/4} dx$$

Integral = ______

46. (1 point)

Using an upper-case ”C” for any arbitrary constants, find the general indefinite integral

$$\int (-9x^3 + 9x - 2)\, dx$$

Integral = ______

47. (1 point)

Using an upper-case ”C” for any arbitrary constants, find the general indefinite integral

$$\int (3 - \sqrt{x})^2\, dx$$

Integral = ______

48. (1 point)

Using an upper-case ”C” for any arbitrary constants, find the general indefinite integral

$$\int -8x\sqrt{x}\, dx$$

Integral = ______

49. (1 point)

Using an upper-case ”C” for any arbitrary constants, find the general indefinite integral

$$\int (-7\cos(x) - 9\sin(x))\, dx$$

Integral = ______

50. (1 point)

Evaluate the integral

$$\int_{-1}^{0} (10x + 6e^x)\, dx$$

Integral = ______

51. (1 point)

Evaluate the integral

$$\int_{1}^{4} \sqrt{t}(-10+t)\, dt$$

Integral = ______

52. (1 point)

Evaluate the integral

$$\int_{1}^{2} \frac{-3y - 7y^7}{y^3}\, dy$$

Integral = ______

53. (1 point)
Evaluate the following integral by making the given substitution:

$$\int x^2\sqrt{x^3+6}\,dx, \quad u=x^3+6$$

Note: Any arbitrary constants used must be an upper-case "C".

____

54. (1 point)
Evaluate the following integral by making the given substitution:

$$\int \frac{-3\sin(\sqrt{x})}{\sqrt{x}}\,dx, \quad u=\sqrt{x}$$

Note: Any arbitrary constants used must be an upper-case "C".

____

55. (1 point)
Evaluate the indefinite integral

$$\int 5x(x^2+3)^4\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

56. (1 point)
Evaluate the indefinite integral

$$\int -5(2-x)^6\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

57. (1 point)
Evaluate the indefinite integral

$$\int \frac{10x}{(x^2+1)^2}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

58. (1 point)
Evaluate the indefinite integral

$$\int 4\sec(2x)\tan(2x)\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

59. (1 point)
Evaluate the indefinite integral

$$\int \frac{-7(\ln(x))^2}{x}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

60. (1 point)
Evaluate the indefinite integral

$$\int \frac{-9\cos(\sqrt{t})}{\sqrt{t}}\,dt$$

Note: Any arbitrary constants used must be an upper-case "C".

____

61. (1 point)
Evaluate the indefinite integral

$$\int 5\cos(x)\sin^6(x)\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

62. (1 point)
Evaluate the indefinite integral

$$\int e^x\sqrt{5+e^x}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

63. (1 point)
Evaluate the indefinite integral

$$\int \frac{8}{x\ln(x)}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

64. (1 point)
Evaluate the indefinite integral

$$\int \frac{-8e^x}{e^x+1}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

65. (1 point)
Evaluate the indefinite integral

$$\int \frac{5\cos(\pi/x)}{x^2}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

66. (1 point)
Evaluate the indefinite integral

$$\int 8\sqrt[3]{x^3+1}\,x^5\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

67. (1 point)
Evaluate the indefinite integral

$$\int \frac{2x}{1+x^4}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

68. (1 point)
Evaluate the indefinite integral

$$\int \frac{-6x^2}{\sqrt{1-x}}\,dx$$

Note: Any arbitrary constants used must be an upper-case "C".

____

69. (1 point)
Evaluate the definite integral (if it exists)

$$\int_0^4 \frac{3x}{\sqrt{1+2x}}\,dx$$

If the integral does not exist, type "DNE".

____

70. (1 point) Sketch the region enclosed by $y = e^{2x}, y = e^{4x}$ and $x = 1$.

Decide whether to integrate with respect to x or y, and then find the area of the region.

The area is __________.

71. (1 point) Sketch the region enclosed by $x + y^2 = 30$ and $x + y = 0$.

Decide whether to integrate with respect to x or y, and then find the area of the region.

The area is ____________________.

72. (1 point) Evaluate the indefinite integral.

$\int e^{6x}\sin(7x)\,dx =$ ____________________ $+C$.

73. (1 point) Evaluate the definite integral.

$\int_0^1 x^2\sqrt[4]{e^x}\,dx =$ ____________________

74. (1 point) Evaluate the definite integral.

$\int_1^6 \sqrt{t}\ln(t)\,dt =$ ____________________

75. (1 point) **Integration by Parts:** This is the most important integration technique we've discussed in this class. It has a wide range of applications beyond increasing our list of integration rules.

$\int z^3 \ln z\,\mathrm{d}z =$ ________________.

$\int e^t \cos t\,\mathrm{d}t =$ ________________.

$\int_0^{2\pi} \sin(x)\sin(x+1)\,\mathrm{d}x =$________________.

76. (1 point) Sketch the region enclosed by the given curves and decide whether to integrate with respect to x or y. Find the area of the region bounded by $2y = 4\sqrt{x}$, $y = 5$ and $2y + 2x = 6$.

Answer: __________

77. (1 point) Sketch the region enclosed by the given curves and decide whether to integrate with respect to x or y. Find the area of the region bounded by $y = 4x^2$ and $y = x^2 + 3$

Answer: ________________

78. (1 point) Find total area enclosed by the graphs of $y = 9x^2 - x^3 + x$ and $y = x^2 + 16x$.

Answer: ________

79. (1 point) Use integration by parts to evaluate the integral.

$$\int xe^{2x}dx$$

Answer: ________________________ $+C$

80. (1 point) Use integration by parts to evaluate the integral.

$$\int 2x\cos(4x)dx$$

Answer: ________________________ $+C$

81. (1 point) Use integration by parts to evaluate the definite integral.

$$\int_1^7 \sqrt{t}\ln t\,dt$$

Answer: ________________________

82. (1 point) Evaluate the definite integral.

$$\int_2^7 \ln x^{33}dx$$

Answer: ________________________

83. (1 point) Evaluate the indefinite integral.

$$\int x\sin^2(8x)dx$$

____

84. (1 point) Evaluate the indefinite integral.

$$\int \ln(x^2+17x+70)\,dx$$

____

85. (1 point)
Evaluate the integral

$$\int_{\pi/2}^{3\pi/4} 4\sin^5(x)\cos^3(x)\,dx$$

____

86. (1 point)
Evaluate the integral

$$\int 1\sin^3(mx)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

87. (1 point)
Evaluate the integral

$$\int_0^{\pi/2} -3\cos^2(x)\,dx$$

____

88. (1 point)
Evaluate the integral

$$\int_0^{\pi} -9\cos^6(x)\,dx$$

____

89. (1 point)
Evaluate the integral

$$\int_0^{\pi/2} 9\sin^2(x)\cos^2(x)\,dx$$

____

90. (1 point)
Evaluate the integral

$$\int_0^{\pi/2} -4\sec^4(t/2)\,dt$$

____

91. (1 point)
Evaluate the integral

$$\int -1\tan^4(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

92. (1 point)
Evaluate the integral

$$\int 7\csc(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration. Also, use 1/tan(x) for cot(x), and use 1/sin(x) for csc(x).

____

93. (1 point)
Evaluate the integral

$$\int -9\sin(5x)\sin(2x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

94. (1 point)
Evaluate the integral

$$\int 9\sin(3x)\cos(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

95. (1 point)
Evaluate the integral

$$\int 9\cos(7x)\cos(5x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

96. (1 point)
Evaluate the integral

$$\int \frac{-7(1-\tan^2(x))}{\sec^2(x)}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

97. (1 point)
Evaluate the integral

$$\int 10\sin^5(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

98. (1 point)
Evaluate the integral

$$\int 1\sin^4(x)\cos^4(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

99. (1 point)
Evaluate the integral using the indicated trigonometric substitution.

$$\int -7x^3\sqrt{9-x^2}\,dx, \quad x = 3\sin(\theta)$$

Note: Use an upper-case "C" for the constant of integration.

____

100. (1 point)
Evaluate the integral

$$\int_0^{2\sqrt{3}} \frac{3x^3}{\sqrt{16-x^2}}\,dx$$

____

101. (1 point)
Evaluate the integral

$$\int \frac{-3}{x^2\sqrt{25-x^2}}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

102. (1 point)
Evaluate the integral

$$\int 7\sqrt{1-4x^2}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

103. (1 point)
Evaluate the integral

$$\int \frac{-4}{x^2\sqrt{16x^2-9}}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

104. (1 point)
Evaluate the integral

$$\int_0^1 9\sqrt{x^2+1}\,dx$$

____

105. (1 point)
Evaluate the integral

$$\int -7\sqrt{5+4x-x^2}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

106. (1 point)
Evaluate the integral

$$\int \frac{-3}{(5-4x-x^2)^{5/2}}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

107. (1 point)
Evaluate the integral

$$\int_0^{\pi/2} \frac{9\cos t}{\sqrt{1+\sin^2(t)}}\,dt$$

____

108. (1 point) Find the average value of $f(x) = \frac{3}{x^3} + 2x$ on the interval $[1,2]$.

Average value $=$ ______________________

109. (1 point) Find the mean value of the function $f(x) = |8-x|$ on the closed interval $[5,11]$.
mean value = __________

110. (1 point) A solid lies between two parallel planes 4 feet apart and has a volume of 43 cubic feet. What is the average area of cross-sections of the solid by planes that lie between the given ones?

____

111. (1 point) Find the average value of : $f(x) = 7\sin x + 3\cos x$
on the interval $[0, 17\pi/6]$

Average value = ______________________

112. (1 point) One fine day in Rochester the low temperature occurs at 5 a.m.
and the high temperature at 5 p.m. The temperature varies sinusoidally all day.

The temperature t hours after midnight is

$$T(t) = A + B\sin\left(\frac{\pi(t-C)}{12}\right)$$

where A, B, and C are certain constants.
The low temperature is 28 and the high temperature is 36.
Find the average temperature during the first 8 hours after noon.
Hint: The high and low temperatures can be used together to find
A and B. Determine C from the fact that it is hottest at 5 p.m.

____

113. (1 point)
(a) Find the average value of the function $f(x) = 1(x-3)^2$ on the interval $[2,5]$.
$f_{ave} =$ ______________

(b) Find two values of c such that $f_{ave} = f(c)$. List these values in increasing order.
Smaller value of c = ______________
Larger value of c = ______________

114. (1 point)
(a) Find the average value of the function $f(x) = 2\sin(x) - \sin(2x)$ on the interval $[0, \pi]$.
$f_{ave} =$ ______________

(b) Use a calculator, computer, or the graph of f to find two values of c such that $f_{ave} = f(c)$. List these values in increasing order. Make sure your answers are correct to three decimal places.
Smaller value of c = ______________
Larger value of c = ______________

115. (1 point)
(a) Find the average value of the function $f(x) = \dfrac{2x}{(1+x^2)^2}$ on the interval $[0, 2]$.
$f_{ave} =$ ______________

(b) Use a calculator, computer, or the graph of f to find two values of c such that $f_{ave} = f(c)$. List these values in increasing order. Make sure your answers are correct to three decimal places.
Smaller value of c = ______________
Larger value of c = ______________

116. (1 point)
Find the average value of the function $f(x) = 10x^2$ on the interval [-1, 1].
$f_{ave} =$ ______________

117. (1 point)
Find the average value of the function $f(x) = -10/x$ on the interval [1, 4].
$f_{ave} =$ ______________

118. (1 point)
Find the average value of the function $g(x) = 9\cos(x)$ on the interval $[0, \pi/2]$.
$g_{ave} =$ ______________

119. (1 point)
Find the average value of the function $g(x) = -1x^2\sqrt{1+x^3}$ on the interval [0, 2].
$g_{ave} =$ ______________

120. (1 point)
Find the average value of the function $f(t) = 1te^{-t^2}$ on the interval [0, 5].
$f_{ave} =$ ______________

121. (1 point)
Find the average value of the function $f(t) = 4\sec(t)\tan(t)$ on the interval $[0, \pi/4]$.
$f_{ave} =$ ______________

122. (1 point)
Find the average value of the function $h(r) = -6/(1+r)^2$ on the interval [1, 6].
$h_{ave} =$ ______________

123. (1 point)
Which of the following is the correct form of the partial fraction decomposition of $\dfrac{x-1}{x^3+x}$?

- A. $\dfrac{A}{x} + \dfrac{B}{x^2+1}$
- B. $\dfrac{Ax+B}{x} + \dfrac{C}{x^2+1}$
- C. $\dfrac{Ax+B}{x} + \dfrac{Cx+D}{x^2+1}$
- D. $\dfrac{A}{x} + \dfrac{Bx+C}{x^2+1}$

124. (1 point)
Which of the following is the correct form of the partial fraction decomposition of $\dfrac{x^4}{x^4-1}$?

- A. $-1 + \dfrac{A}{x+1} + \dfrac{B}{x-1} + \dfrac{Cx+D}{x^2+1}$
- B. $1 + \dfrac{A}{x+1} + \dfrac{B}{x-1} + \dfrac{C}{x^2+1}$
- C. $-1 + \dfrac{A}{x+1} + \dfrac{B}{x-1} + \dfrac{C}{x^2+1}$
- D. $1 + \dfrac{A}{x+1} + \dfrac{B}{x-1} + \dfrac{Cx+D}{x^2+1}$

125. (1 point)
Evaluate the integral

$$\int \frac{2r^2}{r+4}\,dr$$

Note: Use an upper-case "C" for the constant of integration.
____

126. (1 point)
Evaluate the integral

$$\int \frac{-8}{(t+4)(t-1)}\,dt$$

Note: Use an upper-case "C" for the constant of integration.
____

127. (1 point)
Evaluate the integral

$$\int_0^1 \frac{5x-5}{x^2+3x+2}\,dx$$

____

128. (1 point)
Evaluate the integral

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

Note: Use an upper-case "C" for the constant of integration.

____

129. (1 point)
Evaluate the integral

$$\int \frac{-3x^2}{(x+1)^3}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

130. (1 point)
Evaluate the integral

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

Note: Use an upper-case "C" for the constant of integration.

____

131. (1 point)
Evaluate the integral

$$\int \frac{-5x-20}{x^2+2x+5}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

132. (1 point)
Evaluate the integral

$$\int \frac{8}{x^4-x^2}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

133. (1 point)
Make a substitution to express the integrand as a rational function and then evaluate the integral

$$\int \frac{-1\cos(x)}{\sin^2(x)+\sin(x)}\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

134. (1 point)
Use integration by parts and the technique of partial fractions to evaluate the integral

$$\int 7x\arctan(x)\,dx$$

Note: Use an upper-case "C" for the constant of integration.

____

135. (1 point)
Let S be the solid obtained by rotating the region bounded by the curves $y = x(x-1)^2$ and $y = 0$ about the y-axis. If you sketch the given region, you'll see that it can be awkward to find the volume V of S by slicing (the disk/washer method). Use cylindrical shells to find V.
Volume = ______________

136. (1 point)
Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the curves $y = x^3$, $y = 8$, and $x = 0$ about the x-axis.
Volume = ______________

137. (1 point)
Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the curves $y = 4x^2$ and $2x+y = 6$ about the x-axis.
Volume = ______________

138. (1 point)
The region bounded by $x = 1-y^4$ and $x = 0$ is rotated about the line $x = 2$. Find the volume of the resulting solid by any method.
Volume = ______________

139. (1 point)
Using disks or washers, find the volume of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = \sqrt{x}$ about the line $y = 1$.
Volume = ______________

140. (1 point)
Using disks or washers, find the volume of the solid obtained by rotating the region bounded by the curves $y = x$ and $y = \sqrt{x}$ about the line $x = 2$.
Volume = ______________

141. (1 point)
Which of the following integrals represents the volume of the solid obtained by rotating the region bounded by the curves $y = \tan^3(x)$, $y = 1$, and $x = 0$ about the line $y = 1$?

- A. $\pi\int_0^1 (\tan^3(x))^2\,dx$
- B. $\pi\int_0^1 \tan^5(x)\,dx$
- C. $\pi\int_0^{\pi/4} (\tan^3(x))^2\,dx$
- D. $\pi\int_0^{\pi/4} \tan^5(x)\,dx$
- E. $\pi\int_0^1 (1-\tan^3(x))^2\,dx$
- F. $\pi\int_0^{\pi/4} (1-\tan^3(x))^2\,dx$

142. (1 point)
Which of the following integrals represents the volume of the solid obtained by rotating the region bounded by the curves $y = \sin(x)$ and $y = 0$, with $0 \le x \le \pi$ about the line $y = -2$?

- A. $\pi \int_0^{\pi} [\sin(x) - 2]^2\,dx$
- B. $\pi \int_{-2}^{0} [\sin(x) - 2]^2\,dx$
- C. $\pi \int_{-2}^{0} [(\sin(x) + 2)^2 - (2)^2]\,dx$
- D. $\pi \int_{-2}^{0} [\sin^2(x) + 2^2 - 2^2]\,dx$
- E. $\pi \int_0^{\pi} [(\sin(x) + 2)^2 - (2)^2]\,dx$
- F. $\pi \int_0^{\pi} [\sin^2(x) + 2^2 - 2^2]\,dx$

143. (1 point)
Use the method of cylindrical shells to find the volume of the solid obtained by rotating the region bounded by the curves $y = 4x - x^2$ and $y = 8x - 2x^2$ about the line $x = -2$.
Volume = ______

144. (1 point)
Call an improper definite integral type 1 if it is improper because the interval of integration is infinite.
Call it type 2 if it is improper because the function takes on an infinite value within the interval of integration.
Classify the type(s) for each of the following improper integrals.

[?] 1. $\int_0^1 \frac{1}{2x-1}\,dx$
[?] 2. $\int_{-\infty}^{\infty} \frac{\sin(x)}{1+x^2}\,dx$
[?] 3. $\int_1^2 \ln(x-1)\,dx$
[?] 4. $\int_1^2 \frac{1}{2x-1}\,dx$

145. (1 point)
Consider the integral
$$\int_1^{\infty} \frac{-8}{(3x+1)^2}\,dx$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

146. (1 point)
Consider the integral
$$\int_{-\infty}^{0} \frac{3}{2x-5}\,dx$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

147. (1 point)
Consider the integral
$$\int_{-\infty}^{-1} \frac{-10}{\sqrt{2-w}}\,dw$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

148. (1 point)
Consider the integral
$$\int_4^{\infty} 1e^{-y/2}\,dy$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

149. (1 point)
Consider the integral
$$\int_{-\infty}^{\infty} -4xe^{-x^2}\,dx$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

150. (1 point)
Consider the integral
$$\int_{-\infty}^{\infty} 4x^2e^{-x^3}\,dx$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

151. (1 point)
Consider the integral
$$\int_{2\pi}^{\infty} 3\sin(\theta)\,d\theta$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

152. (1 point)
Consider the integral
$$\int_1^{\infty} \frac{-3x-3}{x^2+2x}\,dx$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

153. (1 point)
Consider the integral
$$\int_0^{\infty} -1se^{-5s}\,ds$$
If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

______

154. (1 point)
Consider the integral

$$\int_1^\infty \frac{10\ln(x)}{x}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

155. (1 point)
Consider the integral

$$\int_1^\infty \frac{-10\ln(x)}{x^3}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

156. (1 point)
Consider the integral

$$\int_0^3 \frac{3}{x\sqrt{x}}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

157. (1 point)
Consider the integral

$$\int_{-2}^3 \frac{-4}{x^4}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

158. (1 point)
Consider the integral

$$\int_0^{33} 7(x-1)^{-1/5}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

159. (1 point)
Consider the integral

$$\int_{-1}^1 \frac{6e^x}{e^x-1}\,dx$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

160. (1 point)
Consider the integral

$$\int_0^2 10z^2\ln(z)\,dz$$

If the integral is divergent, type an upper-case "D". Otherwise, evaluate the integral.

____

161. (1 point)

Determine whether the sequence $a_n = \dfrac{13n+6}{7n+11}$ converges or diverges. If it converges, find the limit.
Converges (y/n): __________
Limit (if it exists, blank otherwise): ____________________

162. (1 point) Find the first six terms of the recursively defined sequence

$$s_n = 5s_{n-1}+1 \quad \text{for } n>1, \quad \text{and } s_1 = 1.$$

first six terms = ____________________
(Enter your answer as a comma-separated list.)

163. (1 point) Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit. If it diverges to infinity, state your answer as INF. If it diverges to negative infinity, state your answer as MINF. If it diverges without being infinity or negative infinity, state your answer as DIV.

$$\lim_{n\to\infty} \frac{6(n!)}{(6)^n}$$

____

164. (1 point) Find the limit of the sequence whose terms are given by

$a_n = (n^2)(1-\cos(\frac{5.1}{n}))$.

____

165. (1 point)
Compute the sum
$\sum_{i=1}^{75}(2i-1) =$ _______________.

166. (1 point) Consider the sequence

$$a_n = \frac{\ln(1/n)}{\sqrt{2n}}.$$

Write the first five terms of a_n, and find $\lim_{n\to\infty} a_n$. If the sequence diverges, enter "divergent" in the answer box for its limit.
a) First five terms: ________,________,________,________,________.

b) $\lim_{n\to\infty} a_n =$ ____________________.

167. (1 point) Suppose

$$a_1 = 2, a_{n+1} = \frac{1}{2}\left(a_n + \frac{2}{a_n}\right).$$

Find $\lim_{n\to\infty} a_n =$ ________________.

Hint: Let $a = \lim_{n\to\infty}$. Then, since $a_{n+1} = \frac{1}{2}\left(a_n + \frac{2}{a_n}\right)$, we have $a = \frac{1}{2}\left(a + \frac{2}{a}\right)$. Now solve for a.

168. (1 point) Consider the series:

$$\sum_{k=10}^{\infty}\left(\frac{3}{(k-1)^2} - \frac{3}{k^2}\right)$$

a) Determine whether the series is convergent or divergent: ________.
(Enter "convergent" or "divergent" as appropriate.)
b) If it converges, find its sum: ________________.
If the series diverges, enter here "divergent" again.

169. (1 point) For each sequence, find a formula for the general term, a_n. For example, answer n^2 if given the sequence $\{1,4,9,16,25,36,...\}$

___1. $\frac{1}{2}, \frac{1}{4}, \frac{1}{6}, \frac{1}{8}, \ldots$
___2. $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, \ldots$

170. (1 point) Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit.

(If it diverges to infinity, state your answer as *inf* . If it diverges to negative infinity, state your answer as *-inf* . If it diverges without being infinity or negative infinity, state your answer as *div* .)

$$\lim_{n\to\infty} \frac{12(5^n)+12}{13(5^n)}$$

Answer: ____________

171. (1 point) Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit.

(If it diverges to infinity, state your answer as *inf* . If it diverges to negative infinity, state your answer as *-inf* . If it diverges without being infinity or negative infinity, state your answer as *div*)

$$\lim_{n\to\infty} (-1)^n \sin(12/n)$$

Answer: ____________

172. (1 point) Determine the sum of the following series.

$$\sum_{n=1}^{\infty} \frac{(-2)^{n-1}}{7^n}$$

Answer: ____________

173. (1 point) Determine whether the series is convergent or divergent. If convergent, find the sum; if divergent, enter *div* .

$$\sum_{n=1}^{\infty} \ln\frac{n}{n+1}$$

Answer: ________

174. (1 point) Find the values of x for which the series below converges.

$$\sum_{n=1}^{\infty} x^n 3^n$$

Answer: $|x| <$ ____

175. (1 point) If a sequence $c_1, c_2, c_3, \ldots$ has limit K then the sequence $e^{c_1}, e^{c_2}, e^{c_3}, \ldots$ has limit e^K. Use this fact together with l'Hopital's rule to compute the limit of the sequence given by $b_n = (1+\frac{5.2}{n})^n$.

____

176. (1 point) Determine whether the sequence is divergent or convergent. If it is convergent, evaluate its limit. If it diverges to infinity, state your answer as "INF" (without the quotation marks). If it diverges to negative infinity, state your answer as "MINF". If it diverges without being infinity or negative infinity, state your answer as "DIV".

$$\lim_{n\to\infty} \frac{n^n}{e^{-4n}}$$

____

177. (1 point) For the following series, if it converges, enter the limit of convergence. If not, enter "DIV" (unquoted).

$$\sum_{n=1}^{\infty} \ln(2(n+1)) - \ln(2n)$$

____

178. (1 point)

Use the Comparison Theorem to determine whether the following integral is convergent or divergent.

$\boxed{?}$1. $\displaystyle\int_1^{\infty} \frac{7\cos^2(x)}{1+x^2}\,dx$

179. (1 point)
Use the Comparison Theorem to determine whether the following integral is convergent or divergent.

$\boxed{?}$1. $\int_1^\infty \frac{8x}{\sqrt{1+x^6}}\,dx$

180. (1 point) (a) Compute s_5 (the 5th partial sum) of $s = \sum_{n=1}^{\infty} \frac{3}{3n^5}$ ______

(b) Estimate the error in using s_5 as an approximation of the sum of the series. (i.e. use $\int_5^\infty f(x)dx \geq R_5$) ______

(c) Use n = 5 and

$$s_n + \int_{n+1}^{\infty} f(x)dx \leq s \leq s_n + \int_n^\infty f(x)dx$$

to find a better estimate of the sum.
______ $\leq s \leq$ ______

181. (1 point) Find the value of

$$\int_2^\infty \frac{dx}{(3x-2)^2}$$

______

Determine whether
$\sum_{n=2}^{\infty} \left(\frac{1}{(3n-2)^2}\right)$
Enter A if series is convergent, B if series is divergent. ___

182. (1 point) Determine the convergence or divergence of the following series.

$$\sum_{n=1}^{\infty} \frac{3^k + k}{k!}$$

- A. convergent
- B. divergent

183. (1 point) Determine the sum of the following series.

$$\sum_{n=1}^{\infty} \frac{(-4)^{n-1}}{5^n}$$

Answer: ______

184. (1 point) Determine whether the series is convergent or divergent. If convergent, find the sum; if divergent, enter *div* .

$$\sum_{n=1}^{\infty} \ln \frac{n}{n+1}$$

Answer: ______

185. (1 point) Find the values of x for which the series below converges.

$$\sum_{n=1}^{\infty} x^n 8^n$$

Answer: $|x| <$ ____

186. (1 point) Compute the value of the following improper integral. If it converges, enter its value. Enter **infinity** if it diverges to ∞, and **-infinity** if it diverges to $-\infty$. Otherwise, enter **diverges.**

$\int_2^\infty \frac{dx}{3x(\ln(7x))^2} =$ ______

Does the series $\sum_{n=2}^{\infty} \frac{1}{3n(\ln(7n))^2}$ converge or diverge?

- ?
- converges
- diverges to +infinity
- diverges to -infinity
- diverges

187. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{7}{3+7^n}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

188. (1 point) Determine whether the following series converges or diverges:

$$\sum_{n=1}^{\infty} \frac{6}{\sqrt{n(n+4)(n+5)}}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

189. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{n^9+6}{n^{10}+8}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

190. (1 point) Determine whether the following series converges or diverges:

$$\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^5+4}}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

191. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{4^n}{2+5^n}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

192. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{5}{\sqrt{n}+6}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

193. (1 point) Use the ratio test to determine whether $\sum_{n=18}^{\infty} \frac{n+9}{n!}$ converges or diverges.

(a) Find the ratio of successive terms. Write your answer as a fully simplified fraction. For $n \geq 18$,

$$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| = \lim_{n\to\infty} \_\_\_\_\_\_\_\_\_\_$$

(b) Evaluate the limit in the previous part. Enter ∞ as *infinity* and $-\infty$ as *-infinity.* If the limit does not exist, enter *DNE.*

$\lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right| =$ __________

(c) By the ratio test, does the series converge, diverge, or is the test inconclusive?

- Choose
- Converges
- Diverges
- Inconclusive

194. (1 point) **(a)** Use the comparison test to carefully determine if $\sum_{n=1}^{\infty} \frac{n+3^n}{n3^n-n}$ converges or diverges: this series

- A. converges
- B. diverges

(b) Use the ratio test to carefully determine if $\sum_{n=0}^{\infty} \frac{n^2+3}{3^n}$ converges or diverges: this series

- A. converges
- B. diverges

(c) Use the limit comparison test to carefully determine if $\sum_{n=1}^{\infty} \frac{3^n}{n3^n+n}$ converges or diverges: this series

- A. converges
- B. diverges

195. (1 point) For the following alternating series,

$$\sum_{n=1}^{\infty} a_n = 1 - \frac{(0.5)^2}{2!} + \frac{(0.5)^4}{4!} - \frac{(0.5)^6}{6!} + \frac{(0.5)^8}{8!} - ...$$

how many terms do you have to go for your approximation (your partial sum) to be within 0.0000001 from the convergent value of that series?

____

196. (1 point) The three series $\sum A_n$, $\sum B_n$, and $\sum C_n$ have terms

$$A_n = \frac{1}{n^9}, \quad B_n = \frac{1}{n^2}, \quad C_n = \frac{1}{n}.$$

Use the Limit Comparison Test to compare the following series to any of the above series. For each of the series below, you must enter two letters. The first is the letter (A,B, or C) of the series above that it can be legally compared to with the Limit Comparison Test. The second is C if the given series converges, or D if it diverges. So for instance, if you believe the series converges and can be compared with series C above, you would enter CC; or if you believe it diverges and can be compared with series A, you would enter AD.

___1. $\sum_{n=1}^{\infty} \frac{6n^3+n^2-6n}{8n^{12}-7n^{11}+7}$

___2. $\sum_{n=1}^{\infty} \frac{7n^2+6n^8}{2n^9+8n^3-2}$

___3. $\sum_{n=1}^{\infty} \frac{2n^2+n^9}{1309n^{11}+8n^2+7}$

197. (1 point) Consider the series $\sum_{n=1}^{\infty} a_n$ where

$$a_n = \frac{(n+4)!}{e^{n+1}\sqrt{n+6}}$$

In this problem you must attempt to use the Ratio Test to decide whether the series converges.

Compute

$$L = \lim_{n\to\infty} \left| \frac{a_{n+1}}{a_n} \right|$$

Enter the numerical value of the limit L if it converges, INF if it diverges to infinity, MINF if it diverges to negative infinity, or DIV if it diverges but not to infinity or negative infinity.

$L =$ ______________

Which of the following statements is true?
A. The Ratio Test says that the series converges absolutely.
B. The Ratio Test says that the series diverges.
C. The Ratio Test says that the series converges conditionally.
D. The Ratio Test is inconclusive, but the series converges absolutely by another test or tests.
E. The Ratio Test is inconclusive, but the series diverges by another test or tests.
F. The Ratio Test is inconclusive, but the series converges conditionally by another test or tests.
Enter the letter for your choice here: _____

---

198. (1 point) Determine the convergence or divergence of the following series.

$$\sum_{n=1}^{\infty} \frac{3^k + k}{k!}$$

- A. convergent
- B. divergent

---

199. (1 point) Determine whether the following series is

$$\sum_{n=1}^{\infty} (-1)^{n+1} \frac{1}{5n^{1.1}}$$

- A. conditionally convergent
- B. absolutely convergent
- C. divergent

---

200. (1 point) Determine whether the following series is

$$\sum_{n=2}^{\infty} (-1)^{n} \frac{1}{\sqrt{n^2-1}}$$

- A. conditionally convergent
- B. absolutely convergent
- C. divergent

---

201. (1 point) Match each of the following with the correct statement.
A. The series is absolutely convergent.
C. The series converges, but is not absolutely convergent.
D. The series diverges.

___1. $\sum_{n=1}^{\infty} \frac{(-1)^n 7^{n-1}}{(7)^{n+1} n^{\frac{1}{4}}}$

___2. $\sum_{n=1}^{\infty} \frac{n^7}{4^n}$

___3. $\sum_{n=1}^{\infty} \frac{(n+2)!}{9^n n!}$

___4. $\sum_{n=1}^{\infty} (-1)^n \frac{n!}{5^n}$

___5. $\sum_{n=1}^{\infty} \frac{(-1)^n}{4^n n!}$

---

202. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{2n^5+2}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

---

203. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} (-1)^{n-1} \frac{\sqrt{n}}{n+6}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

---

204. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} (-1)^{n} \frac{n}{8+\ln n}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

---

205. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{n^{2/5}}$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer!

---

206. (1 point) Determine whether the following series converges or diverges.

$$\sum_{n=1}^{\infty} (-1)^{n} \sin\left(\frac{9}{n}\right)$$

Input C for convergence and D for divergence: ___

Note: You have only one chance to enter your answer.

---

207. (1 point) Determine whether the series is absolutely convergent, conditionally convergent, or divergent:

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n\sqrt{n}}$$

Input A for absolutely convergent, C for conditionally convergent, and D for divergent: ___

Note: You have only one chance to enter your answer.

208. (1 point) Determine whether the series is absolutely convergent, conditionally convergent, or divergent:

$$\sum_{n=1}^{\infty} \frac{(-9)^n}{n^9}$$

Input A for absolutely convergent, C for conditionally convergent, and D for divergent: ___

Note: You have only one chance to enter your answer.

209. (1 point) Test each of the following series for convergence by either the Comparison Test or the Limit Comparison Test. If at least one test can be applied to the series, enter CONV if it converges or DIV if it diverges. If neither test can be applied to the series, enter NA. (Note: this means that even if you know a given series converges by some other test, but the comparison tests cannot be applied to it, then you must enter NA rather than CONV.)

_____1. $\sum_{n=1}^{\infty} \frac{(-1)^n}{4n}$
_____2. $\sum_{n=1}^{\infty} \frac{(\ln(n))^2}{n+8}$
_____3. $\sum_{n=1}^{\infty} \frac{4n^7 - n^4 + 5\sqrt{n}}{4n^9 - n^3 + 2}$
_____4. $\sum_{n=1}^{\infty} \frac{\cos(n)\sqrt{n}}{5n+3}$
_____5. $\sum_{n=1}^{\infty} \frac{5n^3}{n^7+3}$

210. (1 point) Select the FIRST correct reason why the given series converges.

A. Convergent geometric series
B. Convergent p series
C. Comparison (or Limit Comparison) with a geometric or p series
D. Cannot apply any test done so far in class

___1. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{\ln(6n)}$
___2. $\sum_{n=1}^{\infty} \frac{(-1)^n \ln(e^n)}{n^4 \cos(n\pi)}$
___3. $\sum_{n=1}^{\infty} \frac{(n+1)(35)^n}{6^{2n}}$
___4. $\sum_{n=1}^{\infty} \frac{(-1)^n}{6n+5}$
___5. $\sum_{n=1}^{\infty} \frac{n^2+\sqrt{n}}{n^4-9}$
___6. $\sum_{n=1}^{\infty} \frac{\sin^2(5n)}{n^2}$

211. (1 point) Select the FIRST correct reason why the given series converges.

A. Convergent geometric series
B. Convergent p series
C. Comparison (or Limit Comparison) with a geometric or p series
D. Alternating Series Test
E. Cannot apply any test done so far in class

___1. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+6}$
___2. $\sum_{n=1}^{\infty} \frac{\sin^2(7n)}{n^2}$
___3. $\sum_{n=1}^{\infty} \frac{n^2+\sqrt{n}}{n^4-6}$
___4. $\sum_{n=1}^{\infty} \frac{2(5)^n}{8^{2n}}$
___5. $\sum_{n=1}^{\infty} \frac{\cos(n\pi)}{\ln(5n)}$
___6. $\sum_{n=1}^{\infty} \frac{(-1)^n}{2n+5}$

212. (1 point) Match each of the following with the correct statement.
A. The series is absolutely convergent.
C. The series converges, but is not absolutely convergent.
D. The series diverges.

___1. $\sum_{n=1}^{\infty} \frac{(-4)^n}{n^2}$
___2. $\sum_{n=1}^{\infty} \frac{(n+1)(5^2-1)^n}{5^{2n}}$
___3. $\sum_{n=1}^{\infty} (-1)^n \frac{\sqrt{n}}{n+8}$
___4. $\sum_{n=1}^{\infty} \frac{\sin(6n)}{n^2}$
___5. $\sum_{n=1}^{\infty} \frac{(-1)^n}{3n+7}$

213. (1 point)
Find the radius of convergence of the power series

$$\sum_{n=1}^{\infty} 10^n x^n n!$$

Your answer should be a nonnegative real number or the phrase "plus_infinity".
Radius of convergence is __________

214. (1 point)
Consider the function

$$\frac{1}{1-x^4}$$

Write a partial sum for the power series which represents this function consisting of the first 5 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6+3^4x^8$. Also indicate the radius of convergence.
Partial Sum: ____________________
Radius of Convergence: ________

215. (1 point)
Consider the function

$$\frac{1}{1+10^2x^2}$$

Write a partial sum for the power series which represents this function consisting of the first 5 nonzero terms. For example, if the series were $\sum_{n=0}^{\infty} 3^n x^{2n}$, you would write $1+3x^2+3^2x^4+3^3x^6+3^4x^8$. Also indicate the radius of convergence.
Partial Sum: ____________________
Radius of Convergence: ________

216. (1 point) Find the interval of convergence for the given power series.

$$\sum_{n=1}^{\infty} \frac{(x-5)^n}{n(-9)^n}$$

The series is convergent
from x = ___, left end included (Y,N): ___
to x = ___, right end included(Y,N): ___

217. (1 point) Match each of the Maclaurin series with right function.

___1. $\sum_{n=0}^{\infty} \frac{x^n}{n!}$
___2. $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{(2n+1)!}$
___3. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$
___4. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{2n+1}$

A. $\arctan(x)$
B. $\cos(x)$
C. $\sin(x)$
D. e^x

218. (1 point) Find the interval of convergence for the given power series.

$$\sum_{n=1}^{\infty} \frac{n^6(x+3)^n}{(8^n)(n^{\frac{20}{3}})}$$

The series is convergent:

from $x =$ ___, left end included (Y,N): ___
to $x =$ ___, right end included (Y,N): ___

219. (1 point) Compute the 10th derivative of

$$f(x) = \frac{\cos\left(4x^2\right)-1}{x^2}$$

at $x=0$.

$f^{(10)}(0) =$ ______________

Hint: Use the MacLaurin series for $f(x)$.

220. (1 point) Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(-1)^n x^n}{\sqrt{n+4}}$$

Answer: ________

Note: Give your answer in **interval notation**.

221. (1 point) Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{x^n}{n!}$$

Answer: ________

Note: Give your answer in **interval notation**.

222. (1 point) Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{8^n(x-6)^n}{n+6}$$

Answer: ________

Note: Give your answer in **interval notation**

223. (1 point) Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(3x-7)^n}{n^2}$$

Answer: ______

Note: Give your answer in **interval notation**

224. (1 point) Suppose that

$$\frac{5x}{x+6} = \sum_{n=0}^{\infty} c_n x^n.$$

Find the following coefficients.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence R of the power series.

$R =$ ______

225. (1 point) Find the Maclaurin series of the function $f(x) = 1x^3 - 6x^2 - 8x + 6$.

$$f(x) = \sum_{n=0}^{\infty} c_n x^n$$

Determine the following coefficients:

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Find the radius of convergence: $R =$ ______

Note: Enter *inf* if the radius of covergence is infinity .

226. (1 point) The Taylor series for $f(x) = e^x$ at $a = 4$ is $\sum_{n=0}^{\infty} c_n (x-4)^n$.

Find the first few coefficients.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

227. (1 point) The Taylor series of function $f(x) = \ln(x)$ at $a = 7$ is given by:

$$f(x) = \sum_{n=0}^{\infty} c_n (x-7)^n$$

Find the following coefficients:

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

Determine the interval of convergence: ______

Note: Give your answer in **interval notation**

228. (1 point) The Taylor series for $f(x) = \cos(x)$ at $a = \frac{\pi}{2}$ is $\sum_{n=0}^{\infty} c_n (x - \frac{\pi}{2})^n$.

Find the first few coefficients.

$c_0 =$ ______

$c_1 =$ ______

$c_2 =$ ______

$c_3 =$ ______

$c_4 =$ ______

229. (1 point) Find the Maclaurin series of the function $f(x) = (5x^2)\sin(6x)$.

$$f(x) = \sum_{n=0}^{\infty} c_n x^n)$$

Compute the following coefficients:
$c_3 =$ ______

$c_4 =$ ______

$c_5 =$ ______

$c_6 =$ ______

$c_7 =$ ______

230. (1 point) Let $F(x) = \int_0^x \sin(7t^2)\, dt$.

Find the MacLaurin polynomial of degree 7 for $F(x)$.

Answer: ______

Use this polynomial to estimate the value of $\int_0^{0.7} \sin(7x^2)\, dx$.

Answer: ______

231. (1 point) Let $F(x) = \int_0^x e^{-2t^4}\, dt$.

Find the MacLaurin polynomial of degree 5 for $F(x)$.

Answer: ______

Use this polynomial to estimate the value of $\int_0^{0.11} e^{-2x^4}\, dx$.

Answer: ______

232. (1 point) Evaluate

$$\lim_{x\to 0} \frac{\ln(1-x)+x+\frac{x^2}{2}}{12x^3}$$

Hint: Use power series.

Answer: ______

233. (1 point) Represent the function $\frac{7}{(1-8x)}$ as a power series $f(x) = \sum_{n=0}^{\infty} c_n x^n$

$c_0 =$ ______
$c_1 =$ ______
$c_2 =$ ______
$c_3 =$ ______
$c_4 =$ ______

Find the radius of convergence $R =$ ______ .

234. (1 point) Determine whether the series is convergent or divergent. If convergent, find the sum; if divergent, enter *div* .

$$\sum_{n=1}^{\infty} \frac{n}{n+12}$$

Answer: ______

235. (1 point) Determine whether the series is convergent or divergent. If convergent, find the sum; if divergent, enter *div* .

$$\sum_{n=1}^{\infty} \frac{n}{\sqrt{n^2+19}}$$

Answer: ______

236. (1 point) Find all the values of x such that the given series would converge.

$$\sum_{n=1}^{\infty} \frac{(3x)^n}{n^2}$$

Answer: ______

Note: Give your answer in **interval notation**.