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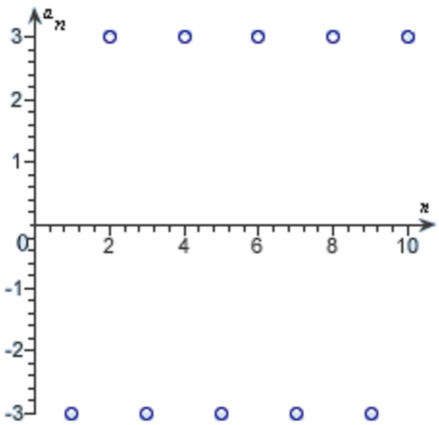
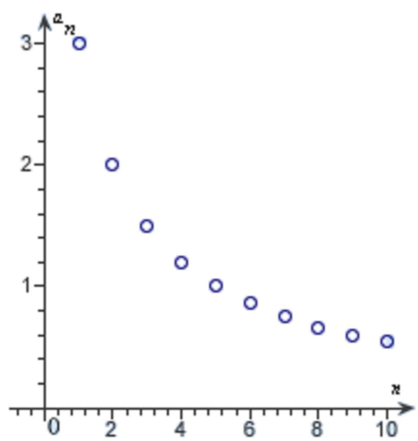
# Ch 9

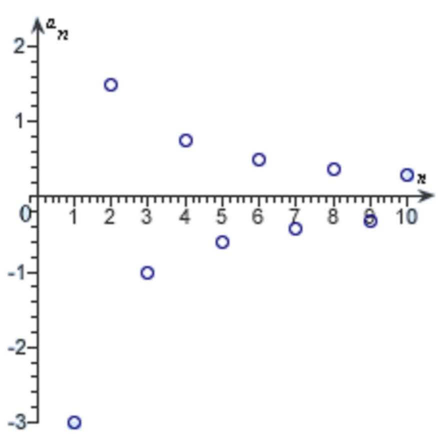
**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

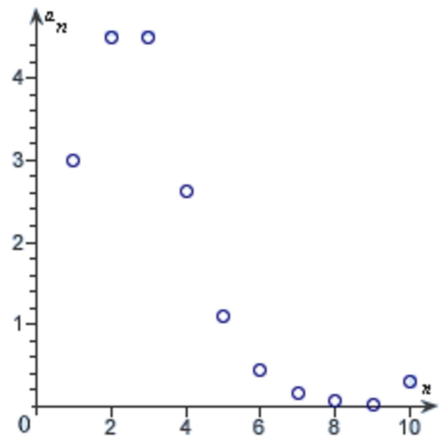
____ 1. Match the sequence with its graph.

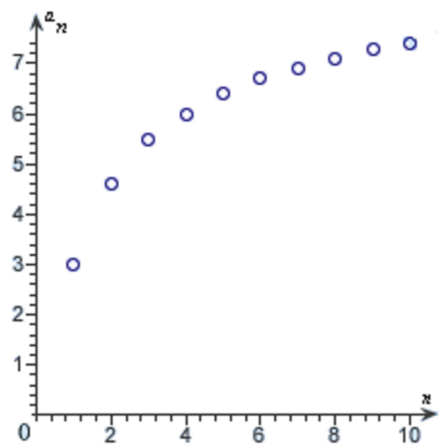
$$a_n = \frac{6}{n+1}$$

a.

$a_n$
3
2
1
0
-1
-2
-3
2 4 6 8 10
$n$

b.

$a_n$
3
2
1
0 2 4 6 8 10
$n$

c.

$a_n$
2
1
0
-1
-2
-3
1 2 3 4 5 6 7 8 9 10
$n$

d.

$a_n$
4
3
2
1
0
2 4 6 8 10
$n$

e.

$a_n$
7
6
5
4
3
2
1
0
2 4 6 8 10
$n$

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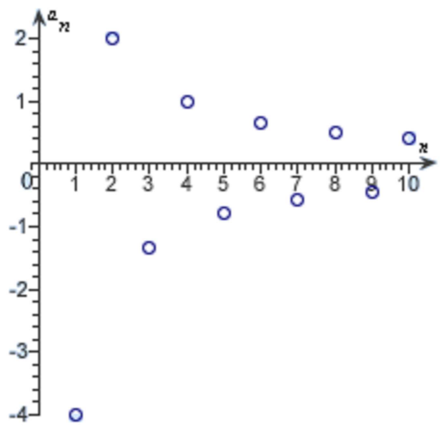
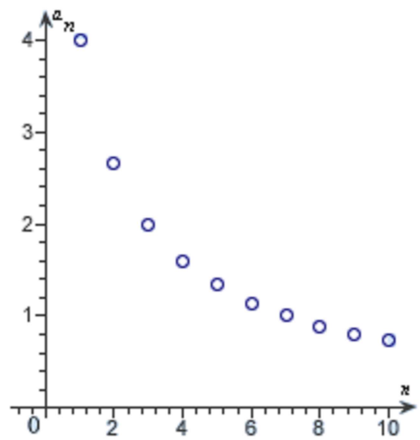
____ 2. Graph the sequence $a_n = 4(-1)^n$.

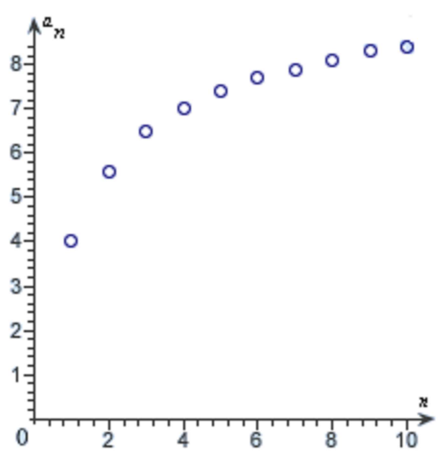
a.



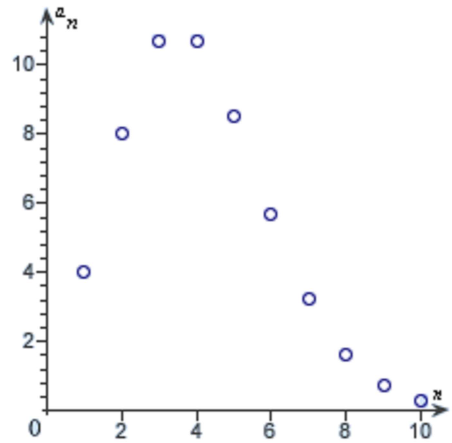

b.



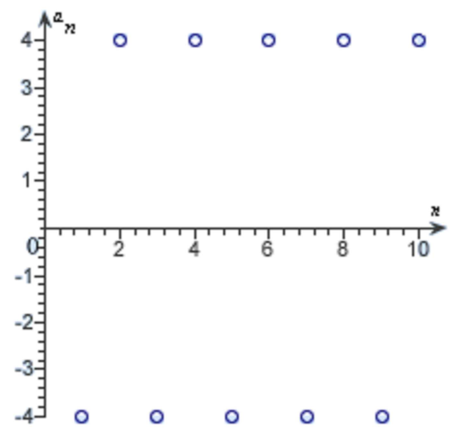

c.




d.




e.



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____ 3. Determine the convergence or divergence of the sequence with the given $n$th term. If the sequence converges, find its limit.

$$a_n = \frac{\ln\left(n^3\right)}{7n}$$

a. The sequence converges to –1.
b. The sequence converges to 0.
c. The sequence diverges.
d. The sequence converges to 1.
e. The sequence diverges to 1.

____ 4. Write an expression for the $n$th term of the sequence $\frac{10}{11}, \frac{19}{20}, \frac{28}{29}, \frac{37}{38}, \ldots.$

a. $\frac{9n}{9n+2}$

b. $\frac{9n}{9n+1}$

c. $\frac{9n-1}{9n+1}$

d. $\frac{9n+1}{9n+2}$

e. $\frac{9n-1}{9n+2}$

____ 5. True or false. The infinite series $\sum_{n=1}^{\infty} \frac{n}{13n+4}$ diverges.

a. false
b. true

____ 6. Find the sum of the convergent series.

$$\sum_{n=0}^{\infty} 9\left(\frac{4}{5}\right)^n$$

a. 4
b. 36
c. 9
d. 27
e. 45

____ 7. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \frac{2}{9n+2}$$

a. diverges
b. Integral Test inconclusive
c. converges

____ 8. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} ne^{-\frac{n}{2}}$$

a. converges
b. diverges
c. Integral Test inconclusive

____ 9. True or false: The series $\frac{\ln 2}{4} + \frac{\ln 3}{6} + \frac{\ln 4}{8} + \frac{\ln 5}{10} + \frac{\ln 6}{12} + \cdots$ converges.

a. false
b. true

____ 10. True or false: The series $\frac{1}{3} + \frac{2}{6} + \frac{3}{11} + \cdots + \frac{n}{n^2+2} + \cdots$ converges.

a. true
b. false

____ 11. True or false: The series $\sum_{n=1}^{\infty} \frac{1}{\sqrt{n+5}}$ converges.

a. false
b. true

____ 12. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=2}^{\infty} \frac{\ln n}{n^{10}}$$

a. diverges
b. Integral Test inconclusive
c. converges

____ 13. Use the Integral Test to determine the convergence or divergence of the series.

$$\sum_{n=2}^{\infty} \frac{10}{n\sqrt{\ln n}}$$

a. diverges
b. converges
c. Integral Test inconclusive

____ 14. True or false: The series $\sum_{n=1}^{\infty} \frac{1}{(6n+7)^3}$ converges.

a. true
b. false

____ 15. True or false: The series $\sum_{n=1}^{\infty} \frac{6n}{4n^2+1}$ diverges.

a. false
b. true

____ 16. Determine the convergence or divergence of the series.

$$8 \cdot \sum_{n=1}^{\infty} \frac{1}{n^{1.15}}$$

a. converges
b. diverges
c. cannot be determined

____ 17. Determine the convergence or divergence of the series.

$$\sum_{n=0}^{\infty} \left(\frac{1}{4}\right)^n$$

a. converges
b. diverges
c. cannot be determined

____ 18. Use the Direct Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{1}{7n^2+9}$.

a. The series $\sum_{n=1}^{\infty} \frac{1}{7n^2+9}$ converges.
b. The series $\sum_{n=1}^{\infty} \frac{1}{7n^2+9}$ diverges.

____ 19. Use the Direct Comparison Test (if possible) to determine whether the series

$$\sum_{n=9}^{\infty} \frac{1}{n^{5/6}-8}$$

a. converges
b. diverges

____ 20. Use the Direct Comparison Test (if possible) to determine whether the series $\sum_{n=1}^{\infty} \frac{2^n}{8^n+1}$ converges or diverges.

a. diverges
b. converges

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____ 21. Use the Direct Comparison Test to determine the convergence or divergence of the series

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

a. The series $\sum_{n=1}^{\infty} \frac{1}{5^4\sqrt{n}-1}$ converges.

b. The series $\sum_{n=1}^{\infty} \frac{1}{5^4\sqrt{n}-1}$ diverges.

____ 22. Use the Direct Comparison Test to determine the convergence or divergence of the series $\sum_{n=0}^{\infty} e^{-n^6}$.

a. The series $\sum_{n=0}^{\infty} e^{-n^6}$ diverges.

b. The series $\sum_{n=0}^{\infty} e^{-n^6}$ converges.

____ 23. Use the Limit Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{9n}{9n^2+2}$.

a. The series $\sum_{n=1}^{\infty} \frac{9n}{9n^2+2}$ converges.

b. The series $\sum_{n=1}^{\infty} \frac{9n}{9n^2+2}$ diverges.

____ 24. Use the Limit Comparison Test (if possible) to determine whether the series $\sum_{n=1}^{\infty} \frac{2}{\sqrt[9]{n^2+9}}$.

a. diverges
b. converges
c. *Limit Comparison* Test does not apply

____ 25. Use the Limit Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{3^n+1}{8^n+1}$.

a. The series $\sum_{n=1}^{\infty} \frac{3^n+1}{8^n+1}$ converges.
b. The series $\sum_{n=1}^{\infty} \frac{3^n+1}{8^n+1}$ diverges.

____ 26. Use the Limit Comparison Test (if possible) to determine whether the series $\sum_{n=1}^{\infty} \frac{4^{n+1}}{5^n-6}$ converges or diverges.

a. diverges
b. converges

____ 27. Use the Limit Comparison Test (if possible) to determine whether the series $\sum_{n=1}^{\infty} \frac{2n^2-7}{7n^7+3n+2}$ converges or diverges.

a. converges
b. diverges

____ 28. Use the Limit Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{9}{n\sqrt{n^2+6}}$.

a. The series $\sum_{n=1}^{\infty} \frac{9}{n\sqrt{n^2+6}}$ diverges.
b. The series $\sum_{n=1}^{\infty} \frac{9}{n\sqrt{n^2+6}}$ converges.

____ 29. Use the Limit Comparison Test to determine the convergence or divergence of the series $\sum_{n=6}^{\infty} \frac{1}{n^7-6}$.

a. The series $\sum_{n=6}^{\infty} \frac{1}{n^7-6}$ diverges.
b. The series $\sum_{n=6}^{\infty} \frac{1}{n^7-6}$ converges.

____ 30. Use the Direct Comparison Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{7n}{\left(n^2+7\right)^2}$.

a. The series $\sum_{n=1}^{\infty} \frac{7n}{\left(n^2+7\right)^2}$ diverges.

b. The series $\sum_{n=1}^{\infty} \frac{7n}{\left(n^2+7\right)^2}$ converges.

____ 31. Determine the convergence or divergence of the series $\frac{1}{251}+\frac{1}{258}+\frac{1}{277}+\frac{1}{314}\ldots$.

a. The series $\frac{1}{251}+\frac{1}{258}+\frac{1}{277}+\frac{1}{314}\ldots$ diverges.

b. The series $\frac{1}{251}+\frac{1}{258}+\frac{1}{277}+\frac{1}{314}\ldots$ converges.

____ 32. Consider the series $\sum_{n=1}^{\infty} \frac{1}{(6n-1)^2}$. The sum of the series is $\pi^2 / 6$ Find the sum of the series $\sum_{n=5}^{\infty} \frac{1}{(6n-1)^2}$.

a. 1.5932
b. 1.5632
c. 1.6132
d. 1.6232
e. 1.5732

____ 33. True or false: The series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} n}{6n+4}$ converges.

a. true
b. false

____ 34. True or false: The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{9^n}$ diverges.

a. true
b. false

____ 35. True or false: The series $\sum_{n=1}^{\infty} \frac{(-1)^n}{(6n+3)!}$ converges .

a. true
b. false

____ 36. Determine whether the series $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n+2}$ converges conditionally or absolutely, or diverges.

a. The series converges conditionally but does not converge absolutely.
b. The series converges absolutely but does not converge conditionally.
c. The series diverges.
d. The series converges absolutely.

____ 37. Determine whether the series $\sum_{n=0}^{\infty} \frac{\cos(n\pi)}{n+3}$ converges conditionally or absolutely, or diverges.

a. The series converges absolutely.
b. The series diverges.
c. The series converges absolutely but does not converge conditionally.
d. The series converges conditionally but does not converge absolutely.

____ 38. Approximate the sum of the series by using the first six terms.

$$\sum_{n=0}^{\infty} \frac{(-1)^n 4}{n!}$$

a. $1.457 < S < 1.477$
b. $1.417 < S < 1.497$
c. $1.467 < S < 1.472$
d. $1.427 < S < 1.467$
e. $1.461 < S < 1.473$

____ 39. Determine the minimal number of terms required to approximate the sum of the series with an error of less than 0.008.

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

a. 3
b. 1
c. 4
d. 6
e. 2

____ 40. Determine the minimal number of terms required to approximate the sum of the series with an error of less than 0.005.

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{(2n)!}$$

a. 6
b. 4
c. 5
d. 8
e. 3

____ 41. Approximate the sum of the series by using the first six terms.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1} 3}{\ln(n+1)}$$

a. $0.587 < S < 3.473$
b. $1.549 < S < 2.511$
c. $1.309 < S < 2.751$
d. $0.427 < S < 3.633$
e. $0.227 < S < 3.833$

____ 42. Use the Ratio Test to determine the convergence or divergence of the series $\sum_{n=0}^{\infty} \frac{n!}{8^n}$.

a. converges
b. diverges

____ 43. Use the Ratio Test to determine the convergence or divergence of the series.

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

a. diverges
b. Ratio Test inconclusive
c. converges

____ 44. Use the Ratio Test to determine the convergence or divergence of the series.

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

a. converges
b. diverges
c. Ratio Test inconclusive

____ 45. Use the Ratio Test to determine the convergence or divergence of the series.

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

a. diverges
b. converges
c. Ratio Test inconclusive

____ 46. Use the Ratio Test to determine the convergence or divergence of the series $\sum_{n=0}^{\infty} \frac{(-1)^n (7)^{8n}}{(7n+1)!}$.

a. diverges
b. converges

____ 47. Use the Root Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{1}{16^n}$.

a. converges
b. diverges

____ 48. Use the Root Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \left(\frac{4n}{3n+1}\right)^n$$

a. converges
b. diverges
c. Root Test inconclusive

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____ 49. Use the Root Test to determine the convergence or divergence of the series.

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

a. converges
b. diverges
c. Root Test inconclusive

____ 50. Use the Root Test to determine the convergence or divergence of the series.

$$\sum_{n=1}^{\infty} \left( \frac{7n^2+1}{10n^2-1} \right)^{n}$$

a. Root Test inconclusive
b. converges
c. diverges

____ 51. Use the Root Test to determine the convergence or divergence of the series $\sum_{n=1}^{\infty} e^{3n}$.

a. converges
b. diverges

____ 52. Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{7(-1)^{n+1}}{n}$ using any appropriate test.

a. converges
b. diverges

____ 53. Identify the most appropriate test to be used to determine whether the series $\sum_{n=1}^{\infty} \frac{15(-1)^{n+1}}{n}$ converges or diverges.

a. Ratio Test
b. $p$-Series Test
c. Alternating Series Test
d. Telescoping Series Test
e. Root Test

____ 54. Determine the convergence or divergence of the series using any appropriate test from this chapter. Identify the test used.

$$\sum_{n=1}^{\infty} \frac{(-1)^n 9}{7n}$$

a. converges; Integral Test
b. converges; Ratio Test
c. converges; Alternating Series Test
d. diverges; Ratio Test
e. diverges; Integral Test

____ 55. Determine the convergence or divergence of the series using any appropriate test from this chapter. Identify the test used.

$$\sum_{n=1}^{\infty} \frac{10}{n^{-}}$$

a. converges; Ratio Test
b. both civerges; *p*-series and civerges; Integral Test
c. civerges; *p*-series
d. civerges; Integral Test
e. converges; *p*-series

____ 56. Determine the convergence or divergence of the series using any appropriate test from this chapter. Identify the test used.

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

a. both diverges; Ratio Test and diverges; Theorem 9.9 ($n^{\text{th}}$ Term Test for Divergence)
b. converges; Integral Test
c. diverges; Theorem 9.9 ($n^{\text{th}}$ Term Test for Divergence)
d. converges; *p*-series
e. diverges; Ratio Test

____ 57. Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{n}{7n^2+1}$ using any appropriate test.

a. converges
b. diverges

____ 58. Determine the convergence or divergence of the series $\sum_{n=1}^{\infty} \frac{\cos n}{10^n}$ using any appropriate test.

a. diverges
b. converges

____ 59. Identify the most appropriate test to be used to determine whether the series $\sum_{n=1}^{\infty} \frac{\cos n}{6^n}$ converges or diverges.

a. Limit Comparison Test with $b_n = \frac{1}{6^n}$
b. Direct Comparison Test with $b_n = \frac{1}{6^n}$
c. Alternating Series Test
d. Root Test
e. Ratio Test

____ 60. Find the values of $x$ for which the series $\sum_{n=0}^{\infty} 5\left(\frac{x}{4}\right)^n$ converges.

a. $-5 < x < 0$
b. $0 < x < 5$
c. $-4 < x < 4$
d. $-5 < x < 5$
e. $0 < x < 4$

____ 61. Find the values of $x$ for which the series $\sum_{n=0}^{\infty} 9(x-1)^n$ converges.

a. $8 < x < 10$
b. $-1 < x < 1$
c. $-9 < x < 0$
d. $0 < x < 2$
e. $-2 < x < 0$

____ 62. Find a first-degree polynomial function $P_1$ whose value and slope agree with the value and slope of $f(x) = \dfrac{10}{\sqrt{x}}$ at $x = 25$.

a. $1 + \dfrac{1}{25}x$

b. $1 - \dfrac{1}{25}x$

c. $-3 - \dfrac{1}{25}x$

d. $3 + \dfrac{1}{25}x$

e. $3 - \dfrac{1}{25}x$

____ 63. Find the Maclaurin polynomial of degree 4 for the function.

$f(x) = e^{9x}$

a. $1 + 9x + \dfrac{81}{2}x^2 + \dfrac{243}{2}x^3 + \dfrac{2187}{8}x^4$

b. $1 - 9x + \dfrac{27}{2}x^2 + \dfrac{243}{2}x^3 + \dfrac{2187}{8}x^4$

c. $1 - 9x + \dfrac{27}{2}x^2 - \dfrac{243}{4}x^3 + \dfrac{2187}{16}x^4$

d. $1 + 9x + \dfrac{27}{2}x^2 + \dfrac{243}{4}x^3 + \dfrac{2187}{16}x^4$

e. $1 + 9x + \dfrac{81}{2}x^2 + \dfrac{729}{4}x^3 + \dfrac{2187}{2}x^4$

____ 64. Find the Maclaurin polynomial of degree 3 for the function.

$f(x) = e^{-9x}$

a. $-1 + 9x - \dfrac{81}{2}x^2 + \dfrac{243}{2}x^3$

b. $1 - 9x + \dfrac{81}{2}x^2 - \dfrac{243}{2}x^3$

c. $1 + 9x + \dfrac{81}{2}x^2 + \dfrac{243}{2}x^3$

d. $1 - 9x - \dfrac{81}{2}x^2 - \dfrac{243}{2}x^3$

e. $1 - 9x + \dfrac{81}{2}x^2 + \dfrac{243}{2}x^3$

____ 65. Find the Maclaurin polynomial of degree 5 for the function.

$f(x) = \sin(2x)$

a. $2x - \frac{4}{3}x^3 + \frac{4}{15}x^5$
b. $2 + \frac{4}{3}x^2 + \frac{2}{3}x^2$
c. $2x - \frac{8}{3}x^3 + \frac{32}{5}x^5$
d. $2x - \frac{4}{3}x^3 + \frac{2}{3}x^5$
e. $2x + \frac{4}{3}x^3 + \frac{4}{15}x^5$

____ 66. Find the Maclaurin polynomial of degree 4 for the function.

$f(x) = \cos(5x)$

a. $1 + \frac{25}{2}x^2 - \frac{625}{24}x^4$
b. $1 - \frac{25}{2}x^2 + \frac{625}{24}x^4$
c. $1 - \frac{125}{6}x^2 + \frac{625}{24}x^4$
d. $1 + \frac{125}{6}x^2 - \frac{625}{24}x^4$
e. $x - \frac{125}{6}x^3 + \frac{625}{24}x^5$

____ 67. Find the fourth degree Maclaurin polynomial for the function.

$f(x) = \frac{1}{x+4}$

a. $\frac{1}{4} + \frac{1}{16}x - \frac{1}{64}x^2 + \frac{1}{256}x^3 - \frac{1}{1024}x^4$
b. $\frac{1}{4} + \frac{1}{16}x + \frac{1}{64}x^2 + \frac{1}{256}x^3 + \frac{1}{1024}x^4$
c. $4 + 16x + 64x^2 + 256x^3 + 1024x^4$
d. $4 - 16x + 64x^2 - 256x^3 + 1024x^4$
e. $\frac{1}{4} - \frac{1}{16}x + \frac{1}{64}x^2 - \frac{1}{256}x^3 + \frac{1}{1024}x^4$

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____ 68. Find the Maclaurin polynomial of degree two for the function $f(x) = \sec(11x)$.

a. $P_2(x) = 1 + \frac{121}{4}x^2$
b. $P_2(x) = 1 - \frac{121}{2}x^2$
c. $P_2(x) = 1 + \frac{121}{2}x^2$
d. $P_2(x) = x + \frac{121}{2}x^2$
e. $P_2(x) = x - \frac{121}{2}x^2$

____ 69. Find the third Taylor polynomial for $f(x) = \frac{7}{x}$, expanded about $c = 1$.

a. $P_3(x) = 7 - 7(x-1) - 14(x-1)^2 - 7(x-1)^3$
b. $P_3(x) = 7 - 7(x-1) + 7(x-1)^2 - 7(x-1)^3$
c. $P_3(x) = 7 - 7(x-1) + 14(x-1)^2 - 14(x-1)^3$
d. $P_3(x) = 7 - 7(x+1) + 7(x+1)^2 - 7(x+1)^3$
e. $P_3(x) = 7 - 7(x-1) - 42(x-1)^2 - 7(x-1)^3$

____ 70. Find the third degree Taylor polynomial centered at $c = 1$ for the function.

$f(x) = \sqrt{x}$

a. $1 + \frac{1}{2}(x+1) - \frac{1}{8}(x-1)^2 + \frac{1}{16}(x+1)^3$
b. $1 + \frac{1}{2}(x-1) + \frac{1}{8}(x-1)^2 - \frac{1}{16}(x-1)^3$
c. $1 + \frac{1}{2}(x-1) - \frac{1}{8}(x-1)^2 + \frac{1}{16}(x-1)^3$
d. $1 + \frac{1}{2}(x-1) - \frac{1}{8}(x-1)^2 - \frac{1}{16}(x-1)^3$
e. $1 + \frac{1}{2}(x+1) + \frac{1}{8}(x-1)^2 - \frac{1}{16}(x+1)^3$

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____ 71. Find the fourth degree Taylor polynomial centered at $c = 7$ for the function.

$f(x) = \ln x$

a. $\ln 7 - \frac{1}{7}(x-7) - \frac{1}{98}(x-7)^2 - \frac{1}{1029}(x-7)^3 - \frac{1}{9604}(x-7)^4$
b. $\ln 7 + 7(x-7) - 98(x-7)^2 + 1029(x-7)^3 - 9604(x-7)^4$
c. $\ln 7 + \frac{1}{7}(x-7) - \frac{1}{98}(x-7)^2 + \frac{1}{1029}(x-7)^3 - \frac{1}{9604}(x-7)^4$
d. $\ln 7 - 7(x-7) + 98(x-7)^2 - 1029(x-7)^3 + 9604(x-7)^4$
e. $\ln 7 - \frac{1}{7}(x-7) + \frac{1}{98}(x-7)^2 - \frac{1}{1029}(x-7)^3 + \frac{1}{9604}(x-7)^4$

____ 72. Determine the degree of the Maclaurin polynomial required for the error in the approximation of the function $\sin(0.6)$ to be less than 0.001.

a. 4
b. 2
c. 5
d. 1
e. 3

____ 73. Determine the values of $x$ for which the function $f(x) = \sin x$ can be replaced by the Taylor polynomial $f(x) = \sin x \approx x - \frac{x^3}{3!}$ if the error cannot exceed 0.008. Round your answer to four decimal places.

a. $-0.9919 < x < 0.9919$
b. $-1.9838 < x < 1.9838$
c. $-0.2480 < x < 0.2480$
d. $-1.9919 < x < 1.9919$
e. $-0.4960 < x < 0.4960$

____ 74. State where the power series $\sum\limits_{n=1}^{\infty} \frac{(x-2)^n}{n^3}$ is centered.

a. 0
b. $-3$
c. 2
d. 3
e. $-2$

____ 75. Find the radius of convergence of the power series.

$$\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{5^n}$$

a. $\frac{1}{25}$
b. $\frac{1}{5}$
c. 5
d. $\infty$
e. 25

____ 76. Find the radius of convergence of the power series.

$$\sum_{n=0}^{\infty} \frac{(8x)^{2n}}{(2n)!}$$

a. $\infty$
b. 16
c. 64
d. 0
e. 8

____ 77. Find the interval of convergence of the power series. (Be sure to include a check for convergence at the endpoints of the interval.)

$$\sum_{n=0}^{\infty} \left(\frac{x}{6}\right)^n$$

a. $\left[-6, 6\right)$
b. $\left(-6, 6\right)$
c. $\left[-6, 6\right]$
d. $\left(\frac{-1}{6}, \frac{1}{6}\right)$
e. $\left[\frac{-1}{6}, \frac{1}{6}\right)$

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____ 78. Find the interval of convergence of the power series. (Be sure to include a check for convergence at the endpoints of the interval.)

$$\sum_{n=0}^{\infty} \frac{(3x)^n}{(4n)!}$$

a. $\left[\frac{-1}{3}, \frac{1}{3}\right)$
b. $\left[-1, 1\right)$
c. $\left(-1, 1\right)$
d. $\left(-\infty, \infty\right)$
e. $\left(-3, 3\right)$

____ 79. Find the interval of convergence of the power series. (Be sure to include a check for convergence at the endpoints of the interval.)

$$\sum_{n=0}^{\infty} \frac{(-1)^n n!\,(x-10)^n}{(9)^n}$$

a. $\{10\}$
b. $\left(-10, 10\right)$
c. $\{0\}$
d. $\left[-10, 10\right)$
e. $\left(-\infty, \infty\right)$

____ 80. Find the interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{(x-12)^{n-1}}{12^{n-1}}$. (Be sure to include a check for convergence at the endpoints of the interval.)

a. $\left(-\infty, 0\right) \cup \left(24, \infty\right)$
b. $\left(-\infty, 0\right] \cup \left[12, \infty\right)$
c. $\left[0, 24\right]$
d. $\left(0, 24\right)$
e. $\left(0, 12\right)$

____ 81. Find the interval of convergence of the power series $\sum_{n=0}^{\infty} \frac{x^{3n+1}}{(3n+1)!}$. (Be sure to include a check for convergence at the endpoints of the interval.)

a. $\left(-\infty, 4\right)$
b. $\left[-4, 4\right]$
c. $\left[-3, 3\right]$
d. $\left(4, \infty\right)$
e. $\left(-\infty, \infty\right)$

____ 82. Write an equivalent series of the series $\sum_{n=0}^{\infty} \frac{x^n}{n!}$ with the index of summation beginning at $n = 5$.

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

b. $\sum_{n=5}^{\infty} \frac{x^{n-5}}{n!}$

c. $\sum_{n=5}^{\infty} \frac{x^{n+5}}{n!}$

d. $\sum_{n=5}^{\infty} \frac{x^{n+5}}{(n+5)!}$

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

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____ 83. Write an equivalent series of the series $\sum\limits_{n=0}^{\infty} \dfrac{(-1)^n x^{6n+1}}{6n+1}$ with the index of summation beginning at $n = 5$.

a. $\sum\limits_{n=5}^{\infty} \dfrac{(-1)^n x^{6n+29}}{6n+29}$

b. $\sum\limits_{n=5}^{\infty} \dfrac{(-1)^n x^{6n-31}}{6n-31}$

c. $\sum\limits_{n=5}^{\infty} \dfrac{(-1)^{n-5} x^{6n-29}}{6n-29}$

d. $\sum\limits_{n=5}^{\infty} \dfrac{(-1)^{n-5} x^{6n+29}}{6n+29}$

e. $\sum\limits_{n=5}^{\infty} \dfrac{(-1)^{n+5} x^{7n-29}}{7n-29}$

____ 84. Consider the function given by $f(x) = \sum\limits_{n=0}^{\infty} \left(\dfrac{x}{14}\right)^n$. Find the interval of convergence for $f'(x)$.

a. $[-14, 14)$
b. $(-14, 0]$
c. $(0, 14)$
d. $[-14, 14]$
e. $(-14, 14)$

____ 85. Consider the function given by $f(x) = \sum\limits_{n=0}^{\infty} \left(\dfrac{x}{9}\right)^n$. Find the interval of convergence for $\int f(x)\,dx$.

a. $(-9, 9)$
b. $(-9, 0]$
c. $[-9, 9]$
d. $[-9, 9)$
e. $(0, 9)$

____ 86. Consider the function given by $f(x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-6)^n}{n}$. Find the interval of convergence for $f'(x)$.

a. $[-6,6]$
b. $[5,7]$
c. $(0,7)$
d. $(-6,6)$
e. $(5,7)$

____ 87. Consider the function given by $f(x) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}(x-7)^n}{n}$. Find the interval of convergence for $\int f(x)\,dx$.

a. $[-7,7]$
b. $[6,8]$
c. $(6,8)$
d. $(0,8)$
e. $(-7,7)$

____ 88. Find the differential equation having the solution $\sum_{n=0}^{\infty} \frac{(-1)^n (4x)^{2n+1}}{(2n+1)!}$.

a. $y'' - 16y = 0$
b. $y'' + 16y' = 0$
c. $y' - 16y = 0$
d. $y'' + 16y = 0$
e. $y' + 16y = 0$

____ 89. Find a geometric power series for the function $\dfrac{1}{7-x}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} \frac{x^n}{7^n+1}$

b. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{x}{7}\right)^n + 1$

c. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{x}{7}\right)^n$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{x^n}{7^{n+1}}$

e. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{x}{7}\right)^{n+1}$

____ 90. Find a geometric power series for the function $\dfrac{1}{6+x}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{6^{n+1}}$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{-x^n}{6^{n+1}}$

c. $\displaystyle\sum_{n=0}^{\infty} \frac{x^n}{6^{n+1}}$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{6^n} + 1$

e. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{6^n+1}$

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____ 91. Find a geometric power series for the function centered at 0, (i) by the technique shown in Examples 1 and 2 and (ii) by long division.

$$f(x) = \frac{10}{4-x}$$

a. $\displaystyle\sum_{n=0}^{\infty} \frac{5}{2}\left(\frac{x}{4}\right)^n$, $|x| < 4$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{1}{4}\left(\frac{x}{4}\right)^n$, $|x| < 4$

c. $\displaystyle\sum_{n=0}^{\infty} 10\left(-\frac{x}{4}\right)^n$, $|x| < 4$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{5}{2}(-4x)^n$, $|x| < 4$

e. $\displaystyle\sum_{n=0}^{\infty} \frac{5}{2}(-x)^n$, $|x| < 1$

____ 92. Find a power series for the function $\dfrac{1}{1-9x}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{x}{9}\right)^n$

b. $\displaystyle\sum_{n=0}^{\infty} (-9x)^n$

c. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{9}{x}\right)^n$

d. $\displaystyle\sum_{n=0}^{\infty} (9x)^n$

e. $\displaystyle\sum_{n=0}^{\infty} (-1)^n (9x)^n$

____ 93. Find a power series for the function $\dfrac{12}{12x+13}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} -\left(\frac{12}{13}\right)^{n+1} x^n$

b. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \left(\frac{12}{13}\right)^{n+1} x^n$

c. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{12}{13}\right)^{n+1} x^n$

d. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \left(\frac{12x}{13}\right)^{n+1}$

e. $\displaystyle\sum_{n=0}^{\infty} (-1)^n \left(\frac{12x}{13}\right)^{n} + 1$

____ 94. Find a power series for the function $\dfrac{24x-35}{6x^2+29x-5}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} \left(-\frac{1}{5^n} + 6^{n+1}\right) x^n$

b. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{x}{5^n} + 6^{n+1}\right) x^n$

c. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{(-1)^n}{5^n} + 6^{n+1}\right) x^n$

d. $\displaystyle\sum_{n=0}^{\infty} \left(-\frac{x}{6^n} + 5^{n+1}\right) x^n$

e. $\displaystyle\sum_{n=0}^{\infty} \left(\frac{(-1)^n}{6^n} + 5^{n+1}\right) x^n$

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____ 95. Find a power series for the function $\dfrac{9}{9+x^2}$ centered at 0.

a. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^{n+1}}{9^n}$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^n}{9^n}$

c. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{9^n}$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n+1}}{9^n}$

e. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{9^{n+1}}$

____ 96. Use the power series $\dfrac{1}{1+x} = \displaystyle\sum_{n=0}^{\infty}(-1)^n x^n$ to determine a power series centered at 0 for the function $f(x) = -\dfrac{8}{(8x+1)^2} = \dfrac{d}{dx}\left[\dfrac{1}{8x+1}\right]$.

a. $\displaystyle\sum_{n=0}^{\infty}(-8)^n n x^{n-1}$

b. $\displaystyle\sum_{n=0}^{\infty}(8)^n n x^{n-1}$

c. $\displaystyle\sum_{n=0}^{\infty}(-8)^n x^n$

d. $\displaystyle\sum_{n=0}^{\infty}(-8)^n x^n$

e. $\displaystyle\sum_{n=0}^{\infty}(-8)^n (n-1) x^{n-1}$

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____ 97. Identify the interval of convergence of a power series $\sum_{n=1}^{\infty}(-3)^n n x^{n-1}$.

a. $-3 < x < 3$
b. $-1 < x < 1$
c. $-\frac{1}{3} < x < \frac{1}{3}$
d. $0 < x < 3$
e. $-\frac{1}{6} < x < \frac{1}{6}$

____ 98. Use the power series $\frac{1}{1+x} = \sum_{n=0}^{\infty}(-1)^n x^n$ to determine a power series centered at 0 for the function

$g(x) = \frac{1}{11x^2+1}$.

.

a. $\sum_{n=0}^{\infty}(-11)^n x^n$
b. $\sum_{n=0}^{\infty}(11)^n x^{2n}$
c. $\sum_{n=0}^{\infty}(-1)^n x^{2n}$
d. $\sum_{n=0}^{\infty}(-1)^n x^n$
e. $\sum_{n=0}^{\infty}(-11)^n x^{2n}$

____ 99. Identify the interval of convergence of a power series $\sum_{n=1}^{\infty}(-9)^n x^{2n}$.

a. $-\frac{1}{3} < x < \frac{1}{3}$
b. $0 < x < \frac{1}{3}$
c. $-\frac{1}{9} < x < \frac{1}{9}$
d. $-\frac{1}{9} < x < 0$
e. $0 < x < \frac{1}{9}$

____ 100. Use the series $\sum_{n=0}^{\infty} (-1)^n \frac{x^{2n+1}}{2n+1}$ for $f(x) = \arctan x$ to approximate the value of $\arctan \frac{1}{8}$ using $R_N \le 0.001$. Round your answer to three decimal places.

a. 0.125
b. 0.111
c. 0.143
d. 0.100
e. 0.133

____ 101. Use the power series $\frac{1}{1-x} = \sum_{n=0}^{\infty} x^n, |x| < 1$ to determine a power series for the function $f(x) = \frac{5x}{(1-5x)^2}$.

a. $\sum_{n=1}^{\infty} n(-1)^n (5x)^{n+1}$
b. $\sum_{n=1}^{\infty} n(-1)^n (5x)^n$
c. $\sum_{n=1}^{\infty} n(5x)^n$
d. $\sum_{n=1}^{\infty} n(5x)^{n-1}$
e. $\sum_{n=1}^{\infty} n(5x)^{n+1}$

____ 102. Identify the interval of convergence of a power series $\sum_{n=1}^{\infty} n(2x)^n$.

a. $-\frac{1}{2} < x < 0$
b. $-\frac{1}{2} < x < \frac{1}{2}$
c. $0 < x < \frac{1}{2}$
d. $-\frac{1}{4} < x < \frac{1}{4}$
e. $0 < x < \frac{1}{4}$

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____ 103. Explain how to use the geometric series $g(x) = \dfrac{1}{1-x} = \sum_{n=0}^{\infty} x^n, |x| < 1$ to find the series for the function $\dfrac{9}{1+x}$.

a. replace $x$ with $\dfrac{9}{(-x)}$
b. replace $x$ with $(-x)$ and multiply the series by 9
c. replace $x$ with $\dfrac{1}{x}$ and divide the series by 9
d. replace $x$ with $(-x)$ and divide the series by 9
e. replace $x$ with $\dfrac{9}{x}$

____ 104. Find the sum of the convergent series $\sum_{n=1}^{\infty} (-1)^{n+1} \dfrac{1}{11^n n}$ by using a well-known function. Round your answer to four decimal places.

a. 0.1671
b. 0.7802
c. 2.4061
d. 0.0870
e. 2.3979

____ 105. Find the sum of the convergent series $\sum_{n=0}^{\infty} (-1)^n \dfrac{1}{4^{2n+1}(2n+1)}$ by using a well-known function. Round your answer to four decimal places.

a. 0.1419
b. 0.2450
c. 0.8961
d. 0.1651
e. 0.1974

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____ 106. Use the definition to find the Taylor series (centered at $c$) for the function.

$f(x) = e^{2x}, c = 0$

a. $\sum_{n=0}^{\infty} \frac{2^{2n}}{n!} x^n$

b. $\sum_{n=0}^{\infty} \frac{2^n}{n!} (-1)^n x^n$

c. $\sum_{n=0}^{\infty} \frac{2^n}{n!} x^n$

d. $\sum_{n=0}^{\infty} \frac{2^n}{n!} (-1)^n x^{2n}$

e. $\sum_{n=0}^{\infty} \frac{2^n}{(2n)!} x^{2n}$

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____ 107. Use the definition to find the Taylor series centered at $c = \frac{\pi}{4}$ for the function $f(x) = \cos x$.

a. $\cos x = \frac{\sqrt{2}}{2} \sum_{n=0}^{\infty} \frac{(-1)^{\frac{n(n-1)}{2}} \left(x + \frac{\pi}{4}\right)^n}{n!}$

b. $\cos x = \frac{\sqrt{2}}{2} \sum_{n=0}^{\infty} \frac{(-1)^{\frac{n(n+1)}{2}} \left(x - \frac{\pi}{4}\right)^n}{n!}$

c. $\cos x = \sqrt{2} \sum_{n=0}^{\infty} \frac{(-1)^n \left(x - \frac{\pi}{4}\right)^n}{n!}$

d. $\cos x = \sqrt{2} \sum_{n=0}^{\infty} \frac{(-1)^{\frac{n(n-1)}{2}} \left(x + \frac{\pi}{4}\right)^n}{n!}$

e. $\cos x = \frac{\sqrt{2}}{2} \sum_{n=0}^{\infty} \frac{(-1)^n \left(x - \frac{\pi}{4}\right)^n}{n!}$

____ 108. Use the definition to find the Taylor series centered at $c = 1$ for the function $f(x) = \dfrac{1}{x}$.

a. $\dfrac{1}{x} = \sum_{n=0}^{\infty} (-1)^n x^n$

b. $\dfrac{1}{x} = \sum_{n=1}^{\infty} (-1)^n (x+1)^n$

c. $\dfrac{1}{x} = \sum_{n=0}^{\infty} (-1)^{n+1} (x-1)^n$

d. $\dfrac{1}{x} = \sum_{n=1}^{\infty} (-1)^n (x)^n$

e. $\dfrac{1}{x} = \sum_{n=0}^{\infty} (-1)^n (x-1)^n$

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____ 109. Use the definition to find the Taylor series (centered at $c$) for the function.

$f(x) = \ln\left(x^2\right), c = 1$

a. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2)}{n}(x-1)^n$

b. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n}(2)}{n}(x-1)^n$

c. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2)}{n}(x-1)^{n-1}$

d. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2)}{n-1}(x-1)^{n-1}$

e. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n-1}(2)}{n-1}(x-1)^n$

____ 110. Use the definition to find the Taylor series centered at $c = 0$ for the function $f(x) = 3\ln\left(x^2+1\right)$.

a. $3\ln\left(x^2+1\right) = \sum_{n=0}^{\infty} \dfrac{(3x)^{2n+2}}{n+1}$

b. $3\ln\left(x^2+1\right) = 3\sum_{n=0}^{\infty} (-1)^n \dfrac{x^{n+1}}{n+1}$

c. $3\ln\left(x^2+1\right) = 3\sum_{n=0}^{\infty} (-1)^n \dfrac{x^{2n+2}}{n+1}$

d. $3\ln\left(x^2+1\right) = 3\sum_{n=0}^{\infty} \dfrac{x^{2n+2}}{n}$

e. $3\ln\left(x^2+1\right) = \sum_{n=0}^{\infty} \dfrac{(3x)^{n+1}}{n+1}$

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____ 111. Use the binomial series to find the Maclaurian series for the function $f(x) = \dfrac{8}{(1+x)^2}$.

a. $\dfrac{8}{(x+1)^2} = 8 + 8\displaystyle\sum_{n=0}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{2^n n!}$

b. $\dfrac{8}{(x+1)^2} = 8 + 8\displaystyle\sum_{n=1}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{2^n n!}$

c. $\dfrac{8}{(x+1)^2} = 8 + 8\displaystyle\sum_{n=0}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{n!}$

d. $\dfrac{8}{(x+1)^2} = 8\displaystyle\sum_{n=0}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{2^n n!}$

e. $\dfrac{8}{(x+1)^2} = 8\displaystyle\sum_{n=1}^{\infty} \dfrac{(2n-1)x^n}{2^n}$

____ 112. Use the binomial series to find the Maclaurian series for the function $f(x) = \dfrac{1}{\sqrt{81+x^2}}$.

a. $\dfrac{1}{\sqrt{81+x^2}} = \dfrac{1}{9} + \sum\limits_{n=0}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{9^n n!}$

b. $\dfrac{1}{\sqrt{81+x^2}} = \dfrac{1}{9} + \sum\limits_{n=1}^{\infty} \dfrac{(-1)^n 1 \cdot 3 \cdot 5 \cdots (2n-1)x^{2n}}{2^n (2n-1)! 9^{2n+1}}$

c. $\dfrac{1}{\sqrt{81+x^2}} = \dfrac{1}{9} + \sum\limits_{n=1}^{\infty} \dfrac{(-1)^n 1 \cdot 3 \cdot 5 \cdots (2n-1)x^{2n}}{2^n n! 9^{2n+1}}$

d. $\dfrac{1}{\sqrt{81+x^2}} = \dfrac{1}{9} + \sum\limits_{n=0}^{\infty} \dfrac{1 \cdot 3 \cdot 5 \cdots (2n-1)x^n}{n!}$

e. $\dfrac{1}{\sqrt{81+x^2}} = \dfrac{1}{9} + \sum\limits_{n=0}^{\infty} \dfrac{(-1)^n 1 \cdot 3 \cdot 5 \cdots (2n-1)x^{2n}}{2^n 9^{2n+1}}$

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____ 113. Use the binomial series to find the Maclaurin series for the function.

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

a. $1 - \frac{1}{2}x^2 + \frac{1}{2!2^2}x^4 - \frac{3}{3!2^3}x^6 + \frac{3(5)}{4!2^4}x^8 - \frac{3(5)(7)}{5!2^5}x^{10} + \cdots\cdots$

$= 1 - \frac{1}{2}x^2 + \frac{1}{8}x^4 - \frac{1}{16}x^6 + \frac{5}{128}x^8 - \frac{7}{256}x^{10} + \cdots\cdots$

b. $1 - \frac{1}{2}x^2 - \frac{1}{2!2^2}x^4 - \frac{3}{3!2^3}x^6 - \frac{3(5)}{4!2^4}x^8 - \frac{3(5)(7)}{5!2^5}x^{10} - \cdots\cdots$

$= 1 - \frac{1}{2}x^2 - \frac{1}{8}x^4 - \frac{1}{16}x^6 - \frac{5}{128}x^8 - \frac{7}{256}x^{10} - \cdots\cdots$

c. $1 + \frac{1}{2}x^2 - \frac{1}{2!2^2}x^4 + \frac{3}{3!2^3}x^6 - \frac{3(5)}{4!2^4}x^8 + \frac{3(5)(7)}{5!2^5}x^{10} - \cdots\cdots$

$= 1 + \frac{1}{2}x^2 - \frac{1}{8}x^4 + \frac{1}{16}x^6 - \frac{5}{128}x^8 + \frac{7}{256}x^{10} - \cdots\cdots$

d. $1 + \frac{1}{2}x^2 + \frac{1}{2!2^2}x^4 + \frac{3}{3!2^3}x^6 + \frac{3(5)}{4!2^4}x^8 + \frac{3(5)(7)}{5!2^5}x^{10} + \cdots\cdots$

$= 1 + \frac{1}{2}x^2 + \frac{1}{8}x^4 + \frac{1}{16}x^6 + \frac{5}{128}x^8 + \frac{7}{256}x^{10} + \cdots\cdots$

e. $-1 + \frac{1}{2}x^2 - \frac{1}{2!2^2}x^4 + \frac{3}{3!2^3}x^6 - \frac{3(5)}{4!2^4}x^8 + \frac{3(5)(7)}{5!2^5}x^{10} - \cdots\cdots$

$= -1 + \frac{1}{2}x^2 - \frac{1}{8}x^4 + \frac{1}{16}x^6 - \frac{5}{128}x^8 + \frac{7}{256}x^{10} - \cdots\cdots$

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____ 114. Find the Maclaurian series for the function $f(x) = e^{\frac{x^7}{9}}$.

a. $e^{\frac{x^7}{9}} = \sum_{n=1}^{\infty} \frac{x^{7n}}{9^n n!}$

b. $e^{\frac{x^7}{9}} = \frac{1}{9} \sum_{n=0}^{\infty} \frac{(-1)^n x^{7n}}{n!}$

c. $e^{\frac{x^7}{9}} = \sum_{n=0}^{\infty} \frac{x^{7n}}{9^n n!}$

d. $e^{\frac{x^7}{9}} = \frac{1}{9} \sum_{n=0}^{\infty} \frac{x^{7n}}{n!}$

e. $e^{\frac{x^7}{9}} = \sum_{n=0}^{\infty} \frac{(-1)^n x^{7n}}{9^n n!}$

____ 115. Find the Maclaurian series for the function $f(x) = \sin 7x$.

a. $\sin 7x = \sum_{n=0}^{\infty} \frac{(-1)^n (7x)^{2n+1}}{(2n+1)!}$

b. $\sin 7x = \sum_{n=0}^{\infty} \frac{(-1)^n (7x)^{2n}}{(2n)!}$

c. $\sin 7x = \sum_{n=0}^{\infty} \frac{(7x)^{2n}}{(2n)!}$

d. $\sin 7x = \sum_{n=0}^{\infty} \frac{(-1)^n (7x)^{2n+1}}{(n+1)!}$

e. $\sin 7x = \sum_{n=0}^{\infty} \frac{(7x)^{2n+1}}{(2n+1)!}$

____ 116. Find the Maclaurin series for the function $f(x) = \cos\left(x^{17/2}\right)$.

a. $\cos\left(x^{17/2}\right) = 1 - \frac{x^{17}}{2!} + \frac{x^{34}}{4!} - \cdots$

b. $\cos\left(x^{17/2}\right) = x - \frac{x^{2}}{2!} + \frac{x^{4}}{4!} - \cdots$

c. $\cos\left(x^{17/2}\right) = x + \frac{x^{17}}{17!} + \frac{x^{34}}{34!} + \cdots$

d. $\cos\left(x^{17/2}\right) = 1 + \frac{x^{17}}{2!} + \frac{x^{34}}{4!} + \cdots$

e. $\cos\left(x^{17/2}\right) = x - \frac{x^{17}}{17!} + \frac{x^{34}}{34!} - \cdots$

____ 117. Use a power series to approximate the value of the integral $\int_0^1 e^{-x^4}\,dx$ with an error of less than 0.01. Round your answer to two decimal places.

a. 0.81
b. 0.74
c. 0.89
d. 0.88
e. 0.84

____ 118. Use a power series to approximate the value of the integral $\int_{0.42}^{0.59} \sqrt{1+x^3}\,dx$ with an error less than 0.001. Round your answer to four decimal places.

a. 0.1925
b. 0.1700
c. 0.1813
d. 0.1933
e. 0.1817

____ 119. Evaluate $\binom{7}{5}$ using the formula $\binom{k}{n} = \dfrac{k(k-1)(k-2)(k-3)\cdots\cdots(k-n+1)}{n!}$ where $k$ is a real number, $n$ is a positive integer, and $\binom{k}{0} = 1$.

a. 31
b. 45
c. 56
d. 21
e. 35

**Name:** ________________________ **ID: A**

____ 120. Use the definition to find the Taylor series centered at $c = 0$ for the function $f(x) = \sin 4x$.

a. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(4x)^{2n-1}}{(2n-1)!}$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^{n}(4x)^{2n+1}}{(2n+1)!}$

c. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n+1}(4x)^{2n+1}}{(2n+1)!}$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^{2n-1}(4x)^{2n-1}}{n!}$

e. $\displaystyle\sum_{n=1}^{\infty} \frac{(-1)^{n}(4x)^{2n+1}}{(2n+1)!}$

# Ch 9
# Answer Section

## MULTIPLE CHOICE

| | | | | |
|---|---|---|---|---|
| 1. | ANS: B | PTS: 1 | DIF: Medium | REF: Section 9.1 |
| | OBJ: Identify the graph of a sequence | | MSC: Skill | |
| 2. | ANS: E | PTS: 1 | DIF: Medium | REF: Section 9.1 |
| | OBJ: Identify the graph of a sequence | | MSC: Skill | |
| 3. | ANS: B | PTS: 1 | DIF: Medium | REF: Section 9.1 |
| | OBJ: Calculate the limit of a sequence if it converges | | | MSC: Skill |
| 4. | ANS: D | PTS: 1 | DIF: Medium | REF: Section 9.1 |
| | OBJ: Write an expression for the nth term of a sequence | | | MSC: Skill |
| 5. | ANS: B | PTS: 1 | DIF: Easy | REF: Section 9.2 |
| | OBJ: Test a series for divergence using the nth Term Test for Divergence | | | |
| | MSC: Skill | | | |
| 6. | ANS: E | PTS: 1 | DIF: Medium | REF: Section 9.2 |
| | OBJ: Calculate the sum of a geometric series | | | MSC: Skill |
| 7. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 8. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 9. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 10. | ANS: B | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 11. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 12. | ANS: C | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 13. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 14. | ANS: A | PTS: 1 | DIF: Easy | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 15. | ANS: B | PTS: 1 | DIF: Easy | REF: Section 9.3 |
| | OBJ: Test a series for convergence using the Integral Test | | | MSC: Skill |
| 16. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a p-series for convergence | | MSC: Skill | |
| 17. | ANS: A | PTS: 1 | DIF: Medium | REF: Section 9.3 |
| | OBJ: Test a geometric series for convergence | | | MSC: Skill |
| 18. | ANS: A | PTS: 1 | DIF: Easy | REF: Section 9.4 |
| | OBJ: Test a series for convergence using the Direct Comparison Test | | | |
| | MSC: Skill | NOT: Section 9.4 | | |
| 19. | ANS: B | PTS: 1 | DIF: Easy | REF: Section 9.4 |
| | OBJ: Test a series for convergence using the Direct Comparison Test | | | |
| | MSC: Skill | | | |

20. ANS: B PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Direct Comparison Test
MSC: Skill
21. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Direct Comparison Test
MSC: Skill
22. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Direct Comparison Test
MSC: Skill
23. ANS: B PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
24. ANS: A PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
25. ANS: A PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
26. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
27. ANS: A PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
28. ANS: B PTS: 1 DIF: Easy REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
29. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
30. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Direct Comparison Test
MSC: Skill
31. ANS: B PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Test a series for convergence using the Limit Comparison Test
MSC: Skill
32. ANS: A PTS: 1 DIF: Medium REF: Section 9.4
OBJ: Calculate the sum of a series using a known sum MSC: Skill
33. ANS: B PTS: 1 DIF: Easy REF: Section 9.5
OBJ: Test an alternating series for convergence MSC: Skill
34. ANS: B PTS: 1 DIF: Easy REF: Section 9.5
OBJ: Test an alternating series for convergence MSC: Skill
35. ANS: A PTS: 1 DIF: Easy REF: Section 9.5
OBJ: Test an alternating series for convergence MSC: Skill
36. ANS: A PTS: 1 DIF: Easy REF: Section 9.5
OBJ: Test a series for absolute/conditional convergence MSC: Skill
37. ANS: D PTS: 1 DIF: Medium REF: Section 9.5
OBJ: Test a series for absolute/conditional convergence MSC: Skill

38. ANS: E PTS: 1 DIF: Medium REF: Section 9.5
OBJ: Approximate the sum of the series by using the first terms
MSC: Skill
39. ANS: A PTS: 1 DIF: Medium REF: Section 9.5
OBJ: Determine the minimal number of terms required to approximate the sum of the series with an error
MSC: Skill
40. ANS: E PTS: 1 DIF: Medium REF: Section 9.5
OBJ: Determine the minimal number of terms required to approximate the sum of the series with an error
MSC: Skill
41. ANS: A PTS: 1 DIF: Medium REF: Section 9.5
OBJ: Approximate the sum of the series by using the first terms
MSC: Skill
42. ANS: B PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Test a series for convergence using the Ratio Test MSC: Skill
43. ANS: C PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Ratio Test MSC: Skill
44. ANS: A PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Ratio Test MSC: Skill
45. ANS: A PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Test a series for convergence using the Ratio Test MSC: Skill
46. ANS: B PTS: 1 DIF: Difficult REF: Section 9.6
OBJ: Test a series for convergence using the Ratio Test MSC: Skill
47. ANS: A PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Root Test MSC: Skill
48. ANS: B PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Root Test MSC: Skill
49. ANS: B PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Root Test MSC: Skill
50. ANS: B PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence using the Root Test MSC: Skill
51. ANS: B PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Test a series for convergence using the Root Test MSC: Skill
52. ANS: A PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence MSC: Skill
53. ANS: C PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Identify the most appropriate test to be used to test a series for convergence
MSC: Skill
54. ANS: C PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the most appropriate test to be used to test a series for convergence
MSC: Skill
55. ANS: B PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the most appropriate test to be used to test a series for convergence
MSC: Skill
56. ANS: C PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the most appropriate test to be used to test a series for convergence
MSC: Skill

57. ANS: B PTS: 1 DIF: Easy REF: Section 9.6
OBJ: Test a series for convergence MSC: Skill
58. ANS: B PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Test a series for convergence MSC: Skill
59. ANS: B PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the most appropriate test to be used to test a series for convergence
MSC: Skill
60. ANS: C PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the interval of convergence of a geometric power series
MSC: Skill
61. ANS: D PTS: 1 DIF: Medium REF: Section 9.6
OBJ: Identify the interval of convergence of a geometric power series
MSC: Skill
62. ANS: E PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Create a first-degree Taylor polynomial for a function MSC: Skill
63. ANS: A PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
64. ANS: B PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
65. ANS: A PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
66. ANS: B PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
67. ANS: E PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
68. ANS: C PTS: 1 DIF: Difficult REF: Section 9.7
OBJ: Write a Maclaurin polynomial for a given function MSC: Skill
69. ANS: B PTS: 1 DIF: Easy REF: Section 9.7
OBJ: Write a Taylor polynomial for a given function MSC: Skill
70. ANS: C PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Taylor polynomial for a given function MSC: Skill
71. ANS: C PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Write a Taylor polynomial for a given function MSC: Skill
72. ANS: A PTS: 1 DIF: Difficult REF: Section 9.7
OBJ: Identify the degree of a Maclaurin polynomial required for a specified accuracy
MSC: Skill
73. ANS: A PTS: 1 DIF: Medium REF: Section 9.7
OBJ: Identify an interval over which a Taylor polynomial approximates a function within a specified accuracy MSC: Skill
74. ANS: C PTS: 1 DIF: Easy REF: Section 9.8
OBJ: Identify the center of a power series MSC: Skill
75. ANS: C PTS: 1 DIF: Easy REF: Section 9.8
OBJ: Identify the radius of convergence of a power series MSC: Skill
76. ANS: A PTS: 1 DIF: Easy REF: Section 9.8
OBJ: Identify the radius of convergence of a power series MSC: Skill
77. ANS: B PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of a power series MSC: Skill

78. ANS: D PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of a power series MSC: Skill
79. ANS: A PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of a power series MSC: Skill
80. ANS: D PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of a power series MSC: Skill
81. ANS: E PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of a power series MSC: Skill
82. ANS: A PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Write a power series as an equivalent series after a change of index
MSC: Skill
83. ANS: C PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Write a power series as an equivalent series after a change of index
MSC: Skill
84. ANS: E PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of the derivative of a power series
MSC: Skill
85. ANS: D PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Identify the interval of convergence of the antiderivative of a power series
MSC: Skill
86. ANS: E PTS: 1 DIF: Difficult REF: Section 9.8
OBJ: Identify the interval of convergence of the derivative of a power series
MSC: Skill
87. ANS: B PTS: 1 DIF: Difficult REF: Section 9.8
OBJ: Identify the interval of convergence of the antiderivative of a power series
MSC: Skill
88. ANS: D PTS: 1 DIF: Medium REF: Section 9.8
OBJ: Verify a series solution to a given differential equation MSC: Skill
89. ANS: D PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
90. ANS: A PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
91. ANS: A PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
92. ANS: D PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
93. ANS: B PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
94. ANS: C PTS: 1 DIF: Difficult REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill

95. ANS: C PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Represent a function as a power series using the geometric power series
MSC: Skill
96. ANS: A PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Represent a function as a power series using differentiation of power series
MSC: Skill
97. ANS: C PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Identify the interval of convergence of a power series MSC: Skill
98. ANS: E PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Represent a function as a power series using a given power series
MSC: Skill
99. ANS: A PTS: 1 DIF: Easy REF: Section 9.9
OBJ: Identify the interval of convergence of a power series MSC: Skill
100. ANS: A PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Approximate a function at a point using a power series MSC: Skill
101. ANS: C PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Represent a function as a power series using differentiation of power series
MSC: Skill
102. ANS: B PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Identify the interval of convergence of a power series MSC: Skill
103. ANS: B PTS: 1 DIF: Medium REF: Section 9.9
OBJ: Explain how to use the geometric power series to find a power series for a function
MSC: Skill
104. ANS: D PTS: 1 DIF: Difficult REF: Section 9.9
OBJ: Calculate the sum of a series using a known power series MSC: Skill
105. ANS: B PTS: 1 DIF: Difficult REF: Section 9.9
OBJ: Calculate the sum of a series using a known power series MSC: Skill
106. ANS: C PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill
107. ANS: B PTS: 1 DIF: Easy REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill
108. ANS: E PTS: 1 DIF: Easy REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill
109. ANS: A PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill
110. ANS: C PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill
111. ANS: B PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Maclaurian series for a function using the binomial series
MSC: Skill
112. ANS: C PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Maclaurian series for a function using the binomial series
MSC: Skill

113. ANS: C PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Maclaurian series for a function using the binomial series
MSC: Skill
114. ANS: C PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Maclaurian series for a function using a known power series
MSC: Skill
115. ANS: A PTS: 1 DIF: Easy REF: Section 9.10
OBJ: Write the Maclaurian series for a function using a known power series
MSC: Skill
116. ANS: A PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Maclaurian series for a function using a known power series
MSC: Skill
117. ANS: E PTS: 1 DIF: Difficult REF: Section 9.10
OBJ: Approximate a definite integral by using power series MSC: Skill
118. ANS: C PTS: 1 DIF: Difficult REF: Section 9.10
OBJ: Approximate a definite integral using power series MSC: Skill
119. ANS: D PTS: 1 DIF: Easy REF: Section 9.10
OBJ: Evaluate a binomial coefficient MSC: Skill
120. ANS: A PTS: 1 DIF: Medium REF: Section 9.10
OBJ: Write the Taylor series of a function centered at a specified point
MSC: Skill