1. Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \frac{1}{81}, \ldots\right\}$$

2. Use the Integral Test to determine whether the series is convergent or divergent.

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

3. Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = e^{1/n}$$

4. Determine whether the sequence converges or diverges. If it converges, find the limit.

$$a_n = \sqrt[n]{3^{2n+1}}$$

5. Determine whether the sequence defined as follows is convergent or divergent.

$a_1 = 1$, $a_{n+1} = 4 - a_n$ for $n \geq 1$

6. Test the series for convergence or divergence.

$$\sum_{n=5}^{\infty} \frac{n^2 - 25}{n^2 + 5n}$$

7. Test the series for convergence or divergence.

$$\sum_{k=1}^{\infty} \frac{(-3)^{k+1}}{4^{2k}}$$

8. Find the values of p for which the series is convergent.

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

9. Determine whether the sequence is increasing, decreasing, or not monotonic. Is the sequence bounded?

$$a_n = \frac{1}{2n+3}$$

10. Test the series for convergence or divergence.

$$\sum_{m=1}^{\infty} (\sqrt[m]{3} - 1)^m$$

11. Determine whether the series is conditionally convergent, absolutely convergent, or divergent.

$$\sum_{n=1}^{\infty} (-1)^{n-1} n^{-1/3}$$

12. Find the interval of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{6x^n}{\sqrt[5]{n}}$$

13. Find the radius of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{8^n x^n}{(n+5)^2}$$

14. Use the sum of the first 10 terms to approximate the sum of the series. Estimate the error.

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

15. Determine the interval of convergence for the function.

$$f(y) = \arctan\left(\frac{y}{9}\right)$$

16. Find the sum of the series.

$$\sum_{n=2}^{\infty} n(n-1)x^{n+1} \ , |x| < 1$$

17. Find the Maclaurin series for f and its radius of convergence.

$$f(x) = \ln(1-x)$$

18. Evaluate the indefinite integral as an infinite series.

$$\int \sin(4x)^2 \, dx$$

19. Find the Taylor polynomial T_2 for the function f at the number a = 1.

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

20. Use the binomial series to expand the function as a power series. Find the radius of convergence.

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

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form A

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1. $a_n = \dfrac{1}{3^{n-1}}$

2. divergent

3. 1

4. 9

5. divergent

6. divergent

7. convergent

8. $p < -1$

9. Decreasing, yes

10. convergent

11. CC

12. [-1, 1)

13. 1/8

14. 0.76352, error < 0.001

15. (-9, 9)

16. $\dfrac{2x^3}{(1-x)^3}$

17. $-\sum_{n=0}^{\infty} \dfrac{x^n}{n},\ R = 1$

18. $C + \sum_{n=0}^{\infty} \dfrac{(-1)^n 4^{4n+2} x^{4n+3}}{(4n+3)(2n+1)!}$

19. $T_2 = 1 + \dfrac{1}{2}(x-1) - \dfrac{1}{8}(x-1)^2$

20. $|x| < 2$

1. Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{1,\ -\frac{1}{3},\ \frac{1}{9}, -\frac{1}{27},\ \ldots\right\}$$

2. Find the value of the limit for the sequence.

$$\left\{\arctan\left(\frac{3n}{3n+8}\right)\right\}$$

3. Find the exact value of the limit of the sequence defined by $a_1 = \sqrt{3},\ a_{n+1} = \sqrt{3+a_n}$.

4. Use the Integral Test to determine whether the series is convergent or divergent.

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

5. Find the partial sum s_{10} of the series $\displaystyle\sum_{n=1}^{\infty} \frac{9}{n^5}$. Approximate the answer to the nearest thousandth.

6. Find the partial sum s_7 of the series $\displaystyle\sum_{m=1}^{\infty} \frac{3}{10+7^m}$. Give your answer to five decimal places.

7. How many terms of the series $\displaystyle\sum_{m=2}^{\infty} \frac{18}{9m(\ln m)^2}$ would you need to add to find its sum to within 0.02?

8. Find all positive values of *b* for which the series $\displaystyle\sum_{n=1}^{\infty} 4b^{\ln 3n}$ converges.

9. Write the partial sum of the converging series which represent the decimal number 0.2523.

10. Test the series for convergence or divergence.

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

11. Approximate the sum to the indicated accuracy.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^7} \qquad \text{(five decimal places)}$$

12. Approximate the sum to the indicated accuracy.

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{3^n n!} \qquad \text{(four decimal places)}$$

13. Test the series for convergence or divergence.

$$\sum_{k=5}^{\infty} \frac{5}{k(\ln k)^6}$$

14. Test the series for convergence or divergence.

$$\sum_{m=1}^{\infty} \frac{3^m m^5}{m!}$$

15. Test the series for convergence or divergence.

$$\sum_{k=1}^{\infty} \cos k$$

16. Test the series for convergence or divergence.

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

17. Test the series for convergence or divergence.

$$\sum_{k=1}^{\infty} \frac{k \ln k}{(k+4)^3}$$

18. Use Taylor's Inequality to estimate the accuracy $|R_4|$ of the approximation $f(x)$ at the number a = 1, when $0 \le x \le 2$.

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

19. A car is moving with speed 23 m/s and acceleration 2m/s^2 at a given instant. Using a second-degree Taylor polynomial, estimate how far the car moves in the next second.

20. The resistivity of a conducting wire is the reciprocal of the conductivity and is measured in units of ohm-meters. The resistivity of a given metal depends on the temperature according to the equation $\rho(t) = \rho_{27} e^{\alpha(t-27)}$ where t is the temperature in C. There are tables that list the values of α (called the temperature coefficient) and ρ_{27} (the resistivity at 27° C) for various metals. Except at very low temperatures, the resistivity varies almost linearly with temperature and so it is common to approximate the expression for $\rho(t)$ by its first-degree Taylor polynomial at t = 27. Find the expression for this linear approximation.

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form B

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1. $a_n = \left(-\frac{1}{3}\right)^{n-1}$

2. $\frac{\pi}{4}$

3. $\frac{1+\sqrt{13}}{2}$

4. divergent

5. 9.332

6. 0.23727

7. $m > e^{100}$

8. $b < \frac{1}{e}$

9. $\frac{1}{5} + \frac{5}{10^2} + \frac{2}{10^3} + \frac{3}{10^4}$

10. divergent

11. 0.99259

12. 0.7165

13. convergent

14. convergent

15. divergent

16. convergent

17. convergent

18. 0.0083

19. 24

20. $\rho_{27}(1+\alpha(t-27))$

1. Determine whether the sequence converges or diverges.

$$a(n) = \frac{2^n}{5^{n+1}}$$

Select the correct answer.

a. converges b. diverges

2. Find the value of the limit for the sequence given.

$$\left\{ \frac{1 \cdot 9 \cdot 17 \cdots (8n+1)}{(8n)^2} \right\}$$

Select the correct answer.

a. π b. -1 c. 3 d. 0 e. 1

3. A sequence $\{a_n\}$ is defined recursively by the equation $a_n = 0.5(a_{n-1} + a_{n-2})$ for $n \ge 3$ where $a_1 = 18,\ a_2 = 9$.

Use your calculator to guess the limit of the sequence.

Select the correct answer.

a. 12 b. 13 c. 6 d. 17 e. 26

4. Find the partial sum s_7 of the series $\sum_{n=1}^{\infty} \frac{1}{2+5^n}$. Give your answer to five decimal places.

Select the correct answer.

a. $s_7 = 0.18976$ b. $s_7 = 0.18985$ c. $s_7 = 1.60976$ d. $s_7 = 0.18975$ e. $s_7 = 0.19176$

5. Given the series $\sum_{m=1}^{\infty} \frac{3m}{4^m(3m+5)}$ estimate the error in using the partial sum s_8 by comparison with the series $\sum_{m=9}^{\infty} \frac{1}{4^m}$.

Select the correct answer.

a. $R_8 \ge 0.0000051$ b. $R_8 \le 2.6130051$ c. $R_8 \le 0.0000051$ d. $R_8 \le 0.000005$ e. $R_8 \ge 0.0000052$

6. Find all positive values of u for which the series $\sum_{m=1}^{\infty} 4u^{\ln 7m}$ converges.

Select the correct answer.

a. $u < 4$ b. $4 < u < \frac{7}{e}$ c. $u > 7$ d. $0 < u < \frac{1}{e}$ e. $u > \ln 7$

7. Evaluate the function $f(x) = \cos x$ by a Taylor polynomial of degree 4 centered at a = 0, and x = 2.

Select the correct answer.

a. 0.67 b. -0.33 c. -1.33 d. 0.28 e. -0.44

8. Given the series :

$$A = \sum_{k=1}^{\infty} \frac{1}{k^5 + 9} \text{ and } B = \sum_{k=1}^{\infty} \frac{1}{k^4 - k}$$

Select the correct answer.

a. Both series are convergent.
b. Both series are divergent.
c. Series A diverges by the Integral Test.
d. Series B and A converges by the Limit Comparison Test.
e. Series B diverges by the Integral Test.

9. Test the series for convergence or divergence.

$$\frac{8}{\ln 2} - \frac{8}{\ln 3} + \frac{8}{\ln 4} - \frac{8}{\ln 5} + \frac{8}{\ln 6} - \cdots$$

Select the correct answer.

a. the series is divergent
b. the series is convergent

10. Use the power series for $f(x) = \sqrt[3]{5+x}$ to estimate $\sqrt[3]{5.08}$ correct to four decimal places.

Select the correct answer.

a. 1.7156 b. 1.7189 c. 1.7195 d. 1.7200 e. 1.7190

11. How many terms of the series do we need to add in order to find the sum to the indicated accuracy?

$$\sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^2} \quad , \ (|\,error\,|) \ < \ 0.0399$$

Select the correct answer.

a. n = 12 b. n = 5 c. n = 13 d. n = 6 e. n = 8

12. Which of the given series are absolutely convergent?

Select the correct answer.

a. $\displaystyle\sum_{n=1}^{\infty} \frac{\sin 3n}{n}$ b. $\displaystyle\sum_{n=1}^{\infty} \frac{\cos \frac{\pi n}{8}}{n\sqrt{n}}$

13. Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

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

Select the correct answer.

a. divergent b. absolutely convergent c. conditionally convergent

14. Test the series for convergence or divergence.

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

Select the correct answer.

a. The series is convergent b. The series is divergent

15. Test the series for convergence or divergence.

$$\sum_{m=1}^{\infty} (\sqrt[m]{5}-1)^m$$

Select the correct answer.

a. The series is divergent b. The series is convergent

16. Find the interval of convergence of the series.

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

Select the correct answer.

a. [-1, 1) b. [-1, 1] c. (-1, 1] d. (-1, 1) e. diverges everywhere

17. Suppose that the radius of convergence of the power series $\sum_{n=0}^{\infty} c_n x^n$ is 16. What is the radius of convergence of the power series $\sum_{n=0}^{\infty} c_n x^{2n}$?

Select the correct answer.

a. 256
b. 4
c. 1
d. 16
e. 252

18. Evaluate the indefinite integral as a power series.

$$\int \tan^{-1}(t^2)\ dt$$

Select the correct answer.

a. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+3}}{(2n+1)(4n+3)}$

b. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+3}}{(4n+3)}$

c. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{4n+2}}{(2n+1)(4n+3)}$

d. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{2n+2}}{(2n+1)}$

e. $C + \sum_{n=0}^{\infty} \frac{(-1)^n t^{2n+3}}{(2n+3)}$

19. Use a power series to approximate the definite integral.

$$\int_0^{0.4} z^4 \tan^{-1}(z^4)\ dz$$

Select the correct answer.

a. 0.4 b. 0.000029 c. 1.400262 d. 1.399738 e. 1.004262

20. Find the Maclaurin series for $f(x)$ using the definition of the Maclaurin series.

$$f(x) = x\cos(4x)$$

Select the correct answer.

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

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

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

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

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

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form C

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1. a

2. d

3. a

4. a

5. c

6. d

7. b

8. a

9. b

10. e

11. b

12. b

13. b

14. a

15. b

16. c

17. b

18. a

19. b

20. b

1. Find the value of the limit of the sequence defined by $a_1 = \sqrt{3}, \;\; a_{n+1} = \sqrt{3 + a_n}$.

Select the correct answer.

a. $\dfrac{1-\sqrt{13}}{2}$ b. $\dfrac{1+\sqrt{13}}{2}$ c. $\dfrac{3}{2}$ d. $\dfrac{-1}{2}$ e. $\dfrac{5}{2}$

2. Determine whether the sequence is increasing, decreasing, or not monotonic. Is the sequence bounded?

$$a_n = \frac{1}{2n+1}$$

Select the correct answer.

a. decreasing   b. not monotonic   c. increasing   d. bounded

3. Find the value of the limit of the sequence defined by $a_1 = 1, \;\; a_{n+1} = 3 - \dfrac{1}{a_n}$.

Select the correct answer.

a. $\dfrac{3+\sqrt{5}}{2}$ b. $\dfrac{3-\sqrt{5}}{2}$ c. $\dfrac{3-\sqrt{10}}{2}$ d. $\dfrac{3+\sqrt{10}}{2}$ e. $3+\sqrt{10}$

4. Find the value of *c*.

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

Select the correct answer.

a. 0   b. $\dfrac{\sqrt{77}-7}{14}$ c. $-\dfrac{\sqrt{77}+7}{14}$ d. $-\dfrac{\sqrt{7}+7}{7}$ e. $\dfrac{\sqrt{7}-7}{2}$

5. Given the two series $A = 1 + \dfrac{1}{4} + \dfrac{1}{9} + \dfrac{1}{16} + \dfrac{1}{25} + \ldots$ and $B = \displaystyle\sum_{n=1}^{\infty} n^5 e^{-n^6}$ determine whether each series is convergent or divergent and choose the correct statement.

Select the correct answer.

a. Both series are divergent.
b. Series *A* is convergent, series *B* is divergent.
c. Both series are convergent.
d. Series *A* is divergent, series *B* is convergent.

6. Find the partial sum s_7 of the series $\sum_{k=1}^{\infty} \frac{3}{4+5^k}$. Give your answer to five decimal places.

Select the correct answer.

a. s_7 = 0.46301   b. s_7 = 0.47999   c. s_7 = 2.276   d. s_7 = 0.466   e. s_7 = 0.566

7. Given the series:

$$A = \sum_{m=1}^{\infty} \frac{\sin^2 5m}{m^{10}\sqrt{m}} \text{ and } B = \sum_{m=1}^{\infty} 8\cos\left(\frac{1}{7m}\right)$$

Determine whether each series is convergent or divergent.

a. *A* is convergent, *B* is divergent.
b. *A* is divergent, *B* is convergent.
c. Both series are convergent.
d. Both series are divergent.

8. Find the interval of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{x^n}{n8^n}$$

Select the correct answer.

a. (-8, 8]   b. (-1,1)   c. [-1, 1]   d. [-8, 8]   e. [-8, 8)   f. diverges everywhere

9. Find the radius of convergence of the series.

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

Select the correct answer.

a. R = ∞ b. R = 0   c. R = $\frac{1}{3}$ d. R = 1   e. R = 3

10. Find the interval of convergence of the series.

$$\sum_{n=1}^{\infty} (-1)^n \frac{(x+8)^n}{n6^n}$$

Select the correct answer.

a. (2, 14]   b. (-14, -2)   c. [-1,1]   d. (-8, 6]   e. [-14, -2)   f. diverges everywhere

11. Find a power series representation for

$f(t) = \ln(10 - t)$

Select the correct answer.

a. $\displaystyle\sum_{n=0}^{\infty} \frac{t^n}{n10^n}$

b. $\displaystyle\sum_{n=1}^{\infty} \frac{10t^n}{n^n}$

c. $\displaystyle\ln 10 - \sum_{n=1}^{\infty} \frac{t^n}{10^n}$

d. $\displaystyle\ln 10 - \sum_{n=1}^{\infty} \frac{t^n}{n10^n}$

e. $\displaystyle\ln 10 + \sum_{n=1}^{\infty} \frac{t^{2n}}{10^n}$

12. Find a power series representation for the function.

$f(y) = \ln\left(\dfrac{7+y}{7-y}\right)$

Select the correct answer.

a. $\displaystyle\sum_{n=0}^{\infty} 14y^{2n+1}$

b. $\displaystyle\sum_{n=0}^{\infty} \frac{y^{2n+1}}{7}$

c. $\displaystyle\sum_{n=7}^{\infty} \frac{14y^{2n+1}}{14}$

d. $\displaystyle\sum_{n=0}^{\infty} \frac{2y^{2n+1}}{7^{n+1}(2n+1)}$

e. $\displaystyle\sum_{n=0}^{\infty} \frac{y^{2n+1}}{7^{n+1}(n+1)}$

13. Use series to approximate the definite integral to within the indicated accuracy.

$\displaystyle\int_0^{0.9} x^2 e^{-x^2}\,dx \quad , \quad |\,error\,| < \ 0.001$

Select the correct answer.

a. 0.1249 b. 0.0125 c. 0.1449 d. 0.0625 e. 0.0825

14. Use series to evaluate the limit correct to three decimal places.

$$\lim_{x\to 0}\frac{7x-\tan^{-1}7x}{x^3}$$

Select the correct answer.

a. 114.133 b. 114.333 c. 34.3233 d. 115.933 e. 118.933

15. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\frac{1}{(1+x)^4}$$

Select the correct answer.

a. $|x|<8$ b. $|x|<10$ c. $|x|<1$ d. $|x|<0.1$ e. $|x|<1.8$

16. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\frac{x}{\sqrt{16+x^2}}$$

Select the correct answer.

a. $|x|<8$ b. $|x|<1$ c. $|x|<4$ d. $|x|<10$ e. $|x|<1.8$

17. Find the Taylor polynomial T_3 for the function f at the number a = 1.

$$f(x)=\ln x$$

Select the correct answer.

a. $(x-1)-\frac{1}{2}(x-1)^2+\frac{1}{3}(x-1)^3$

b. $(x-1)+\frac{1}{5}(x-1)^2+\frac{1}{4}(x-1)^3$

c. $(x+1)-\frac{1}{4}(x+1)^2+\frac{1}{3}(x+1)^3$

d. $(x+1)-\frac{1}{5}(x+1)^2+\frac{1}{7}(x+1)^3$

e. $(x-1)-\frac{1}{5}(x-1)^2-\frac{1}{7}(x-1)^3$

18. Find the Taylor polynomial T_3 for the function $f(x)$ at the number $a = 9$.

$f(x) = \cos x$

Select the correct answer.

a. $\cos(9) - \sin(9)(x+9) - \dfrac{\cos(9)}{2}(x+9)^2 + \dfrac{\sin(9)}{6}(x+9)^3$
b. $\cos(9) - \sin(9)(x-9) - \dfrac{\cos(9)}{2}(x-9)^2 + \dfrac{\sin(9)}{6}(x-9)^3$
c. $\cos(9) + \sin(9)(x-9) + \dfrac{\cos(9)}{2}(x-9)^2 + \dfrac{\sin(9)}{6}(x-9)^3$
d. $\cos(6) + \sin(6)(x-9) + \dfrac{\cos(6)}{6}(x-9)^2 + \dfrac{\sin(6)}{9}(x-9)^3$
e. $\cos(6) + \sin(6)(x-9) + \dfrac{\cos(2)}{2}(x-9)^2 + \dfrac{\sin(2)}{6}(x-9)^3$

19. Use Taylor's Inequality to estimate the accuracy $|R_2|$ of the approximation $f(x)$ at the number $a = 1$, when $0.71 \le x \le 1.29$.

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

Select the correct answer.

a. 1.0407
b. 0.5407
c. 1.5407
d. 1.7407
e. 1.8407

20. Estimate $\sin(35^\circ)$ correct to five decimal places.

Select the correct answer.

a. 1.07358
b. 1.57358
c. 0.57358
d. 1.77358
e. 2.57358

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form D

1. b

2. a, d

3. a

4. b

5. c

6. d

7. a

8. e

9. e

10. b

11. d

12. d

13. a

14. b

15. c

16. c

17. a

18. b

19. b

20. c

1. Determine whether the sequence converges or diverges.

$$a_n = \frac{5+5n^2}{n+n^2}$$

Select the correct answer.

a. converges
b. diverges

2. If $1,600 is invested at 7% interest, compounded annually, then after *n* years the investment is worth $a_n = 1{,}600(1.07)^n$ dollars. Find the size of investment after 7 years.

3. Determine whether the series is convergent or divergent. If it is convergent, write its sum. Otherwise write *divergent.*

$$\sum_{n=1}^{\infty} 7\left(\frac{3}{4}\right)^{n-1}$$

4. Express the number $0.\overline{87}$ as a ratio of integers.

5. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\sqrt[4]{1+x^6}$$

6. When money is spent on goods and services, those that receive the money also spend some of it. The people receiving some of the twice-spent money will spend some of that, and so on. Economists call this chain reaction the multiplier effect. In a hypothetical isolated community, the local government begins the process by spending *D* dollars. Suppose that each recipient of spent money spends $100c\%$ and saves $100s\%$ of the money that he or she receives. The values *c* and *s* are called the marginal propensity to consume and the marginal propensity to save and, of course, $c + s = 1$.
The number $k = 1/s$ is called the multiplier. What is the multiplier if the marginal propensity to consume is 80%?

Select the correct answer.

a. 6 b. 4 c. 5 d. 7 e. 3

7. Find the partial sum s_7 of the series $\displaystyle\sum_{m=1}^{\infty} \frac{5}{6+9^m}$.

Write your answer to five decimal places.

8. Use the sum of the first 9 terms to approximate the sum of the following series:

$$\sum_{n=1}^{\infty} \frac{6}{n^6 + n^2}$$

Write your answer to six decimal places.

9. Determine whether the series converges or diverges.

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

Select the correct answer.

a. neither
b. converges
c. diverges

10. For what values of k does the series $\sum_{n=3}^{\infty} \frac{1}{n^k \ln n}$ converge?

11. Test the series for convergence or divergence.

$$\sum_{n=2}^{\infty} \frac{(-1)^{n-1}}{\sqrt[3]{7 \ln n}}$$

12. Find the radius of convergence of the series.

$$\sum_{n=1}^{\infty} \frac{5^n x^n}{(n+8)^3}$$

13. Find the Maclaurin series for $f(x)$ using the definition of a Maclaurin series.

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

14. Find the Taylor series for $f(x)$ centered at $a = 1$.

$$f(x) = 2 + x + x^2$$

15. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\frac{x^2}{\sqrt{2 + x}}$$

16. Find the Maclaurin series for $f(x)$.

$f(x) = x\cos(6x)$

17. Use multiplication or division of power series to find the first three nonzero terms in the Maclaurin series for the function.

$f(x) = e^{-x^2}\cos 4x$

Select the correct answer.

a. $1-17x^2+19.17x^4$
b. $1-9x^2+11.17x^4$
c. $1-9x^2+19.17x^4$
d. $1-9x+19.17x^2$
e. $1-17x^2+11.17x^4$

18. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\frac{1}{(5+x)^6}$$

19. The following table contains the evaluation of the Taylor polynomial centered at $a = 1$ for $f(x) = 1/x$.

What is the degree of this polynomial?

x	***T(x)***
0.5	1.88
0.7	1.42
1.7	0.45
2.8	-3.39
3	-5.00

Select the correct answer.

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

20. Use the Alternating Series Estimation Theorem or Taylor's Inequality to estimate the range of values of x for which the given approximation is accurate to within the stated error.

$$\cos x \approx 1-\frac{x^2}{2}+\frac{x^4}{24}\ , \ |error| < \ 0.08$$

Write a such that $-a < x < a$.

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form E

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1. a

2. 2569.25

3. 28

4. 29/33

5. $|x| < 1$

6. c

7. 0.39846

8. 3.098422

9. b

10. $k > 1$

11. convergent

12. 1/5

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

14. $4 + 3(x-1) + (x+1)^2$

15. $|x| < 2$

16. $\displaystyle\sum_{n=0}^{\infty} \frac{(-1)^n 6^{2n} x^{2n+1}}{(2n)\,!}$

17. c

18. $|x| < 5$

19. a

20. $-1.965 < x < 1.965$

1. Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{ 1,\ 7,\ 13,\ 19,\ . . . \right\}$$

2. Find the value of the limit for the sequence.

$$\left\{ \frac{1 \cdot 8 \cdot 15 \cdots (7n+1)}{(7n)^2} \right\}$$

3. If \$600 is invested at 4% interest, compounded annually, then after n years the investment is worth $a_n = 600(1.04)^n$ dollars. Find the size of investment after 7 years.

Select the correct answer.

a. \$789.56 b. \$430.21 c. \$1,321.06 d. \$1,230.81 e. \$1,860.81

4. Find the value of the limit of the sequence defined by $a_1 = 1,\ a_{n+1} = 3 - \dfrac{1}{a_n}$.

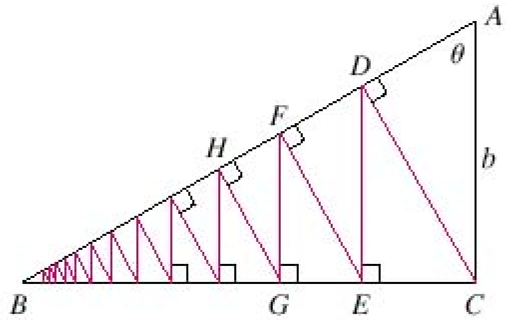
Select the correct answer.

a. $\dfrac{3+\sqrt{10}}{2}$ b. $\dfrac{3-\sqrt{10}}{2}$ c. $\dfrac{3-\sqrt{5}}{2}$ d. $\dfrac{3+\sqrt{5}}{2}$ e. $\dfrac{2+\sqrt{5}}{3}$

5. Use Taylor's Inequality to estimate the accuracy $|R_3|$ of the approximation $f(x)$ at the number $a = 0$, when $0 \le x \le 0.5$.

$$f(x) = \tan x$$

6. A right triangle ABC is given with $\theta = 1.1$ and $|AC| = b = 4$. CD is drawn perpendicular to AB, DE is drawn perpendicular to BC, EF $\perp$ AB and this process is continued indefinitely as shown in the figure. Find the total length of all the perpendiculars $|CD| + |DE| + |EF| + |FG| + ...$



7. Let $A = \sum_{n=10}^{\infty} \frac{3}{n^{4.6}}$ and $B = \int_{9}^{\infty} \frac{3}{x^{4.6}}\, dx$. Compare A and B.

Select the correct answer.

a. $A \geq B$ b. $A \leq B$ c. $A < B$ d. $A > B$ e. $A = B$

8. Given the two series

$A = 1 + \frac{1}{16} + \frac{1}{81} + \frac{1}{256} + \frac{1}{625} + \ldots$ and $B = \sum_{n=1}^{\infty} n^8 e^{-n^9}$ determine whether each series is convergent or divergent and choose the correct statement.

Select the correct answer.

a. Series A is divergent, series B is convergent.
b. Both series are convergent.
c. Series A is convergent, series B is divergent.
d. Both series are divergent.

9. Find the values of s for which the series is convergent.

$$\sum_{k=5}^{\infty} \frac{1}{m \ln m [\ln(\ln m)]^{s}}$$

10. Find the partial sum s_{10} of the series $\sum_{n=1}^{\infty} \frac{7}{n^3}$.

Please approximate the answer to the nearest thousandth.

11. Find the partial sum s_7 of the series $\sum_{m=1}^{\infty} \frac{8}{6 + 10^m}$.

Give your answer to five decimal places.

12. Use the sum of the first 9 terms to approximate the sum of the following series:

$$\sum_{n=1}^{\infty} \frac{4}{n^7 + n^5}$$

Give your answer to six decimal places.

13. Which of the given series is (are) convergent?

Select the correct answer.

a. $\frac{7}{6} - \frac{7}{7} + \frac{7}{8} - \frac{7}{9} + \frac{7}{10} - \ldots$

b. $-\frac{1}{6} + \frac{2}{7} - \frac{3}{8} + \frac{4}{9} - \frac{5}{10} + \ldots$

14. Test the series for convergence or divergence.

$$\frac{6}{\ln 2}-\frac{6}{\ln 3}+\frac{6}{\ln 4}-\frac{6}{\ln 5}+\frac{6}{\ln 6}-\ldots$$

Select the correct answer.

a. the series is divergent
b. the series is convergent

15. Approximate the sum to the indicated accuracy.

$$\sum_{n=0}^{\infty} \frac{(-1)^n}{3^n n\,!} \quad \text{(four decimal places)}$$

16. The terms of a series are defined recursively by the equations $a_1 = 5,\ a_{n+1} = \dfrac{7n+1}{6n+3} a_n$

Determine whether $\sum a_n$ converges or diverges.

17. Estimate $\sin(33^\circ)$ correct to five decimal places.

Select the correct answer.

a. 1.54464 b. 1.04464 c. 0.54464 d. 2.04464 e. 3.54464

18. Test the series for convergence or divergence.

$$\sum_{k=1}^{\infty} \left(\sqrt[k]{3}-1\right)^k$$

19. For which positive integers k is the series $\displaystyle\sum_{n=1}^{\infty} \frac{(n!)^6}{(kn)!}$ convergent?

Select the correct answer.

a. $k \geq 1$
b. $k \leq 0$
c. $k \geq 0$
d. $k \geq 6$
e. $k \leq -6$

20. Find the Taylor polynomial T_3 for the function $f(x)$ at the number $a = 1$.

$f(x) = \sin x$

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form F

1. $a_n = 6n - 5$

2. 0

3. a

4. d

5. 0.0428

6. 32.77

7. c

8. b

9. $(1, \ \infty)$

10. 8.383

11. 0.58431

12. 2.026946

13. a

14. b

15. 0.7165

16. diverges

17. c

18. convergent

19. d

20. $T_3 = \sin(1) + \cos(1) \cdot (x-1) - \frac{\sin(1)}{2} \cdot (x-1)^2 - \frac{\cos(1)}{6} \cdot (x-1)^3$

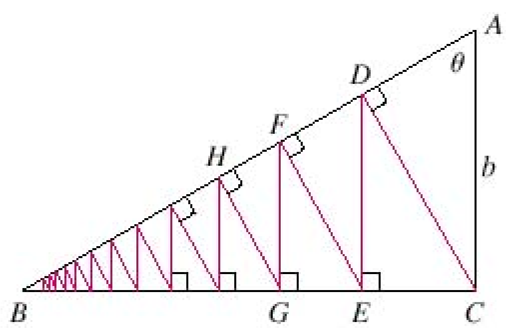
1. Find the value of the limit for the sequence.

$$\left\{\frac{n^8}{n!}\right\}$$

2. Find the exact value of the limit of the sequence defined by $a_1 = \sqrt{3},\ a_{n+1} = \sqrt{3 + a_n}$.

3. Find the exact value of the limit of the sequence defined by $a_1 = 1,\ a_{n+1} = 6 - \dfrac{1}{a_n}$

4. A right triangle ABC is given with $\theta = 1.4$ and |AC| = b = 10. CD is drawn perpendicular to AB, DE is drawn perpendicular to BC, EF $\perp$ AB and this process is continued indefinitely as shown in the figure. Find the total length of all the perpendiculars |CD| + |DE| + |EF| + |FG| + ...



5. A sequence $\{a_n\}$ is defined recursively by the equation $a_n = 0.5(a_{n-1} + a_{n-2})$ for $n \geq 3$ where $a_1 = 21,\ a_2 = 21$. Use your calculator to guess the limit of the sequence.

6. Use the Integral Test to determine whether the series is convergent or divergent.

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

Select the correct answer.

a. the series is divergent
b. the series is convergent

7. Which of the following series is convergent?

Select the correct answer.

a. $\displaystyle\sum_{m=1}^{\infty} \frac{10}{m^8 + 3}$ b. $\displaystyle\sum_{m=1}^{\infty} 10\frac{\ln 6m}{m^2}$ c. $\displaystyle\sum_{m=1}^{\infty} \frac{5}{m \ln 3m}$

8. Find the partial sum s_{10} of the series $\sum_{m=1}^{\infty} \frac{5}{m^3}$.

Please approximate the answer to the nearest thousandth.

9. Find all positive values of *u* for which the series $\sum_{n=1}^{\infty} 8u^{\ln 5n}$ converges.

10. A car is moving with speed 16 m/s and acceleration 6m/s^2 at a given instant. Using a second-degree Taylor polynomial, estimate how far the car moves in the next second.

Select the correct answer.

a. 19.5 m b. 19 m c. 20 m d. 25.5 m e. 30 m

11. Find the Taylor polynomial T_3 for the function *f* at the number *a* = 1.

$f(x) = \ln x$

Select the correct answer.

a. $(x+1) - \frac{1}{3}(x+1)^2 + \frac{1}{2}(x+1)^3$

b. $(x-1) - \frac{1}{2}(x-1)^2 + \frac{1}{3}(x-1)^3$

c. $(x-1) + \frac{1}{4}(x-1)^2 + \frac{1}{2}(x-1)^3$

d. $(x-1) + \frac{1}{2}(x-1)^2 + \frac{1}{4}(x-1)^3$

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

12. Use Taylor's Inequality to estimate the accuracy $|R_4|$ of the approximation $f(x)$ at the number *a* = 1.5, when $0 \le x \le 3$.

$f(x) = \cos x$

13. How many terms of the series do we need to add in order to find the sum to the indicated accuracy?

$$\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n} \ , \ (\ |error| < \ 0.1562 \ )$$

14. Approximate the sum to the indicated accuracy.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^7} \quad \text{(five decimal places)}$$

Select the correct answer.

a. 0.99219 b. 0.99249 c. 0.97269 d. 0.99259 e. 0.98259

15. Which of the partial sums of the alternating series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$ are overestimates of the total sum.

Select the correct answer.

a. s_{100} b. s_{67} c. s_{82} d. s_{91} e. s_{55}

16. Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

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

Select the correct answer.

a. divergent b. absolutely convergent c. conditionally convergent

17. Determine whether the series is absolutely convergent, conditionally convergent, or divergent.

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

Select the correct answer.

a. absolutely convergent b. divergent c. conditionally convergent

18. Find the Maclaurin series for the function $f(x)$.

$f(x) = x \cos 7x$

19. Use multiplication or division of power series to find the first three nonzero terms in the Maclaurin series for the function.

$f(x) = e^{-x^2} \cos 4x$

20. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$\sqrt[4]{1 + x^5}$

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form G

1. 0

2. $\dfrac{1+\sqrt{13}}{2}$

3. $\dfrac{6+4\sqrt{2}}{2}$

4. 677.27

5. 21

6. a

7. a, b

8. 5.988

9. $u < \dfrac{1}{e}$

10. b

11. b

12. 0.0633

13. 5

14. d

15. b, d

16. b

17. a

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

19. $1-9x^2+19.17x^4$

20. $|x| < 1$

1. Determine whether the series is convergent or divergent. If it is convergent, write its sum. Otherwise write *divergent*.

$$\sum_{n=1}^{\infty} 7\left(\frac{3}{4}\right)^{n-1}$$

2. Use the sum of the first 9 terms to approximate the sum of the following series:

$$\sum_{n=1}^{\infty} \frac{6}{n^6 + n^2}$$

Write your answer to six decimal places.

3. Determine whether the series converges or diverges.

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

Select the correct answer.

a. neither b. converges c. diverges

4. Use multiplication or division of power series to find the first three nonzero terms in the Maclaurin series for the function.

$$f(x) = e^{-x^2} \cos 4x$$

Select the correct answer.

a. $1 - 17x^2 + 19.17x^4$
b. $1 - 9x^2 + 11.17x^4$
c. $1 - 9x^2 + 19.17x^4$
d. $1 - 9x + 19.17x^2$
e. $1 - 17x^2 + 11.17x^4$

5. Use the binomial series to expand the function as a power series. Find the radius of convergence.

$$\frac{1}{(5+x)^6}$$

6. Find a formula for the general term a_n of the sequence, assuming that the pattern of the first few terms continues.

$$\left\{ 1,\ 7,\ 13,\ 19,\ \ldots \right\}$$

7. Find the value of the limit for the sequence.

$$\left\{ \frac{1 \cdot 8 \cdot 15 \cdots (7n+1)}{(7n)^2} \right\}$$

8. Find the value of the limit of the sequence defined by $a_1 = 1,\ a_{n+1} = 3 - \dfrac{1}{a_n}$.

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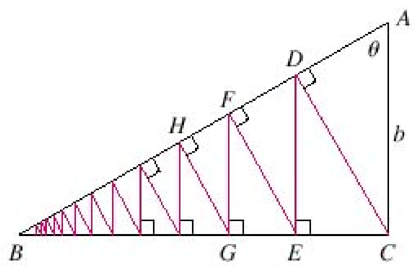
a. $\dfrac{3+\sqrt{10}}{2}$ b. $\dfrac{3-\sqrt{10}}{2}$ c. $\dfrac{3-\sqrt{5}}{2}$ d. $\dfrac{3+\sqrt{5}}{2}$ e. $\dfrac{2+\sqrt{5}}{3}$

9. A right triangle ABC is given with $\theta = 1.1$ and |AC| = b = 4. CD is drawn perpendicular to AB, DE is drawn perpendicular to BC, EF $\perp$ AB and this process is continued indefinitely as shown in the figure. Find the total length of all the perpendiculars |CD| + |DE| + |EF| + |FG| + ...



10. Find the partial sum s_{10} of the series $\sum_{n=1}^{\infty} \dfrac{7}{n^3}$.

Please approximate the answer to the nearest thousandth.

11. The terms of a series are defined recursively by the equations $a_1 = 5,\ a_{n+1} = \dfrac{7n+1}{6n+3} a_n$

Determine whether $\sum a_n$ converges or diverges.

12. Find the Taylor polynomial T_3 for the function $f(x)$ at the number a = 1.

$f(x) = \sin x$

13. Approximate the sum to the indicated accuracy.

$$\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n^7} \quad \text{(five decimal places)}$$

Select the correct answer.

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b. 0.99249
c. 0.97269
d. 0.99259
e. 0.98259

14. Which of the partial sums of the alternating series $\sum_{n=1}^{\infty} \frac{(-1)^{n-1}}{n}$ are overestimates of the total sum.

Select the correct answer.

a. s_{100} b. s_{67} c. s_{82} d. s_{91} e. s_{55}

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$$\sum_{n=1}^{\infty} \frac{(-1)^n n}{2^n} \;,\; (\ |error| < \ 0.1562\ )$$

18. Test the series for convergence or divergence.

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

19. The resistivity of a conducting wire is the reciprocal of the conductivity and is measured in units of ohm-meters. The resistivity of a given metal depends on the temperature according to the equation $\rho(t) = \rho_{27} e^{\alpha(t-27)}$ where t is the temperature in C. There are tables that list the values of α (called the temperature coefficient) and ρ_{27} (the resistivity at 27° C) for various metals. Except at very low temperatures, the resistivity varies almost linearly with temperature and so it is common to approximate the expression for $\rho(t)$ by its first-degree Taylor polynomial at t = 27. Find the expression for this linear approximation.

20. Suppose that the radius of convergence of the power series $\sum_{n=0}^{\infty} c_n x^n$ is 16. What is the radius of convergence of the power series $\sum_{n=0}^{\infty} c_n x^{2n}$?

Select the correct answer.

a. 256 b. 4 c. 1 d. 16 e. 252

ANSWER KEY

Stewart - Calculus 6e Chapter 12 Form H

1. 28

2. 3.098422

3. b

4. c

5. $|x| < 5$

6. $a_n = 6n - 5$

7. 0

8. d

9. 32.77

10. 8.383

11. diverges

12. $T_3 = \sin(1) + \cos(1) \cdot (x-1) - \frac{\sin(1)}{2} \cdot (x-1)^2 - \frac{\cos(1)}{6} \cdot (x-1)^3$

13. d

14. b, d

15. a

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

17. 5

18. convergent

19. $\rho_{27}(1 + \alpha(t - 27))$

20. b