

Name _____

Write the first four terms of $\{a_n\}$.

$$1) a_n = \frac{(-1)^n}{n}$$

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

$$3) a_n = \sin \frac{n\pi}{3}$$

Determine whether the sequence converges or diverges, and, if it converges, find $\lim_{n \rightarrow \infty} a_n$.

$$4) a_n = 9 + (0.3)^n$$

$$5) a_n = \frac{6 + 3n}{1 + 7n}$$

$$6) a_n = (-1)^n \frac{8}{n}$$

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

$$8) a_n = \left(1 + \frac{8}{n}\right)^n$$

$$9) a_n = \frac{n!}{3^n \cdot 7^n}$$

Find an explicit formula for a_n .

$$10) 6, -6, 6, -6, 6, \dots$$

Indicate whether the given series converges or diverges. If it converges, find its sum.

$$11) \sum_{k=0}^{\infty} \frac{1}{(\sqrt{10})^k}$$

$$12) \sum_{k=0}^{\infty} e^{-7k}$$

$$13) \sum_{k=1}^{\infty} \ln \frac{10}{k}$$

$$14) \sum_{k=1}^{\infty} \frac{7^k + 1}{9^k - 1}$$

$$15) \sum_{k=0}^{\infty} \frac{\cos k\pi}{3^k}$$

Write the given decimal as an infinite series, then find the sum of the series, and finally, use the result to write the decimal as a ratio of two integers.

16) 0.161616 . . .

17) 0.9848484 . . .

Solve the problem.

18) A company makes a very durable product. It sells 20,000 in the first year, but will have diminishing sales due to the product's durability, so that each year it can expect to sell only seventy-five percent of the quantity it will have sold the year before. How many of the product can the company expect to eventually sell?

Use the integral test to determine the convergence or divergence of the series.

19)
$$\sum_{k=1}^{\infty} \frac{1}{5k-1}$$

20)
$$\sum_{k=1}^{\infty} \frac{\cos 1/k}{k^2}$$

Determine whether the sequence converges or diverges, and, if it converges, find $\lim_{n \rightarrow \infty} a_n$.

21) $a_n = \ln(4n - 4) - \ln(3n - 1)$

Use the integral test to determine the convergence or divergence of the series.

22) $\sum_{k=1}^{\infty} \frac{1}{(\ln 7)^k}$

23) $\sum_{k=1}^{\infty} \frac{2k}{k^2 + 4}$

Estimate the error that is made by approximating the sum of the given series by the sum of the first five terms.

24) $\sum_{k=1}^{\infty} \frac{1}{k^5}$

Use the limit comparison test to determine if the series converges or diverges.

$$25) \sum_{n=1}^{\infty} \frac{7\sqrt{n}}{5n^{3/2} + 2n - 2}$$

$$26) \sum_{n=1}^{\infty} \frac{3}{9n - 2 \ln n + 9}$$

Use the ratio test to determine if the series converges or diverges.

$$27) \sum_{n=1}^{\infty} \frac{2^n}{n!}$$

$$28) \sum_{n=1}^{\infty} \frac{n^9}{9^n}$$

$$29) \sum_{n=1}^{\infty} \frac{4n!}{n^n}$$

Determine convergence or divergence of the series. (ratio test)

$$30) \sum_{n=1}^{\infty} \left(\frac{\ln n}{5n+7} \right)^n$$

Determine either absolute convergence, conditional convergence or divergence for the series.

$$31) \sum_{n=1}^{\infty} (-1)^n \ln \left[\frac{9n+6}{8n+5} \right]$$

$$32) \sum_{n=1}^{\infty} (-8)^{-n}$$

$$33) \sum_{n=1}^{\infty} (-1)^n (\sqrt{n^2 + 1} - n)$$

Find the convergence set for the given power series.

$$34) \sum_{n=0}^{\infty} (x - 7)^n$$

$$35) \sum_{n=0}^{\infty} \frac{(x - 8)^n}{6n + 8}$$

$$36) \sum_{n=0}^{\infty} \frac{(x - 9)^n}{n^{59n}}$$

Find the radius of convergence of the power series.

$$37) \sum_{n=0}^{\infty} \frac{(x-6)^n}{1+3n}$$

$$38) \sum_{n=1}^{\infty} \frac{(x-2)^n}{(2n)!}$$

Find the power series representation for $f(x)$.

$$39) f(x) = \frac{1}{3+x}$$

$$40) f(x) = e^{5x}$$

$$41) f(x) = \frac{e^{2x}}{1-x}$$

Find the first few nonzero terms of the Maclaurin series for the given function.

$$42) f(x) = \ln(1+2x)$$

$$43) f(x) = xe^{\cos x}$$

Find the first three terms of the Taylor series in $x - a$.

$$44) \cos x, a = \frac{3\pi}{2}$$

$$45) e^x, a = 3$$

$$46) \ln x, a = 1$$

Find the Taylor polynomial of order 3 based at a for the given function.

$$47) \frac{x}{x+6}; a = -1$$

$$48) \frac{1}{x+7}; a = 1$$

$$49) \ln(x+1); a = 7$$

Answer Key

Testname: MATH3B_HWCH11

1) $-1, \frac{1}{2}, -\frac{1}{3}, \frac{1}{4}$

Objective: (9.1) Find Terms of Sequence

2) $1, \frac{3}{5}, \frac{1}{2}, \frac{5}{11}$

Objective: (9.1) Find Terms of Sequence

3) $\frac{\sqrt{3}}{2}, \frac{\sqrt{3}}{2}, 0, -\frac{\sqrt{3}}{2}$

Objective: (9.1) Find Terms of Sequence

4) 9

Objective: (9.1) Determine Convergence/Divergence and Find Limit I

5) $\frac{3}{7}$

Objective: (9.1) Determine Convergence/Divergence and Find Limit I

6) 0

Objective: (9.1) Determine Convergence/Divergence and Find Limit I

7) Diverges

Objective: (9.1) Determine Convergence/Divergence and Find Limit I

8) e^8

Objective: (9.1) Determine Convergence/Divergence and Find Limit II

9) Diverges

Objective: (9.1) Determine Convergence/Divergence and Find Limit II

10) $a_n = 6(-1)^{n+1}$

Objective: (9.1) Write Formula for nth Term of a Sequence

11) Converges; $\frac{10 + \sqrt{10}}{9}$

Objective: (9.2) Determine Convergence/Divergence and Find Sum

12) Converges; $\frac{e^7}{e^7 - 1}$

Objective: (9.2) Determine Convergence/Divergence and Find Sum

13) Diverges

Objective: (9.2) Determine Convergence/Divergence and Find Sum

14) Converges; $\frac{441}{2}$

Objective: (9.2) Determine Convergence/Divergence and Find Sum

15) Converges; $\frac{3}{4}$

Objective: (9.2) Determine Convergence/Divergence and Find Sum

16) $\frac{16}{99}$

Objective: (9.2) Write Repeating Decimal as Fraction

Answer Key

Testname: MATH3B_HWCH11

17) $\frac{65}{66}$

Objective: (9.2) Write Repeating Decimal as Fraction

18) 80,000

Objective: (9.2) Solve Apps: Infinite Series

19) Diverges

Objective: (9.3) Use Integral Test to Determine Convergence/Divergence

20) Converges

Objective: (9.3) Use Integral Test to Determine Convergence/Divergence

21) $\ln\left(\frac{4}{3}\right)$

Objective: (9.1) Determine Convergence/Divergence and Find Limit I

22) Converges

Objective: (9.3) Use Integral Test to Determine Convergence/Divergence

23) Diverges

Objective: (9.3) Use Integral Test to Determine Convergence/Divergence

24) 0.0004

Objective: (9.3) Estimate Error in Approximating Sum

25) Diverges

Objective: (9.4) Use Limit Comparison Test to Determine Convergence/Divergence

26) Diverges

Objective: (9.4) Use Limit Comparison Test to Determine Convergence/Divergence

27) Converges

Objective: (9.4) Use Ratio Test to Determine Convergence/Divergence

28) Converges

Objective: (9.4) Use Ratio Test to Determine Convergence/Divergence

29) Converges

Objective: (9.4) Use Ratio Test to Determine Convergence/Divergence

30) Converges

Objective: (9.4) Determine Convergence/Divergence I

31) Diverges

Objective: (9.5) Determine If Series Converges Absolutely/Conditionally or Diverges

32) Converges absolutely

Objective: (9.5) Determine If Series Converges Absolutely/Conditionally or Diverges

33) Converges conditionally

Objective: (9.5) Determine If Series Converges Absolutely/Conditionally or Diverges

34) $6 < x < 8$

Objective: (9.6) Find Convergence Set for Power Series (Sigma Notation)

35) $7 \leq x < 9$

Objective: (9.6) Find Convergence Set for Power Series (Sigma Notation)

36) $0 \leq x \leq 18$

Objective: (9.6) Find Convergence Set for Power Series (Sigma Notation)

37) 1

Objective: (9.6) Find Radius of Convergence of Power Series

38) ∞

Objective: (9.6) Find Radius of Convergence of Power Series

Answer Key

Testname: MATH3B_HWCH11

$$39) \frac{1}{3} - \frac{x}{9} + \frac{x^2}{27} - \frac{x^3}{81} + \dots$$

Objective: (9.7) Find Power Series Representation of Function

$$40) 1 + 5x + \frac{25x^2}{2!} + \frac{125x^3}{3!} + \dots$$

Objective: (9.7) Find Power Series Representation of Function

$$41) 1 + 3x + 5x^2 + 3x^3 + \dots$$

Objective: (9.7) Find Power Series Representation of Function

$$42) 2x - 2x^2 + \frac{8}{3}x^3 - \dots$$

Objective: (9.8) Find Terms in Maclaurin Series

$$43) ex - \frac{ex^3}{2} + \dots$$

Objective: (9.8) Find Terms in Maclaurin Series

$$44) \left(x - \frac{3\pi}{2}\right) - \frac{1}{3!} \left(x - \frac{3\pi}{2}\right)^3 + \frac{1}{5!} \left(x - \frac{3\pi}{2}\right)^5 - \dots$$

Objective: (9.8) Find Terms in Taylor Series

$$45) e^3 \left[1 + (x - 3) + \frac{1}{2}(x - 3)^2 + \dots \right]$$

Objective: (9.8) Find Terms in Taylor Series

$$46) (x - 1) - \frac{1}{2}(x - 1)^2 + \frac{1}{3}(x - 1)^3 - \dots$$

Objective: (9.8) Find Terms in Taylor Series

$$47) -\frac{1}{5} + \frac{6}{25}(x + 1) - \frac{6}{125}(x + 1)^2 + \frac{6}{625}(x + 1)^3$$

Objective: (9.9) Find Taylor Polynomial

$$48) \frac{1}{8} - \frac{x - 1}{64} + \frac{(x - 1)^2}{512} - \frac{(x - 1)^3}{4096}$$

Objective: (9.9) Find Taylor Polynomial

$$49) \ln 8 + \frac{x - 7}{8} - \frac{(x - 7)^2}{128} + \frac{(x - 7)^3}{1536}$$

Objective: (9.9) Find Taylor Polynomial