AP Calculus BC **Name: _____**

10.1 Worksheet **Per: _____**

Write the first 5 terms of the sequence.

1. $a_n = 4n - 3$

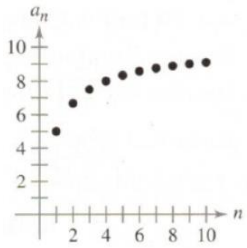
2. $a_n = \sin\left(\frac{n\pi}{2}\right)$

3. $a_n = (-1)^{n+1}\left(\frac{2}{n}\right)$

4. $a_n = 2 + \frac{2}{n} - \frac{1}{n^2}$

Match the sequence with the given nth term with its graph.

A



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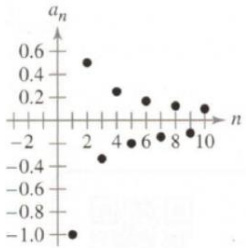

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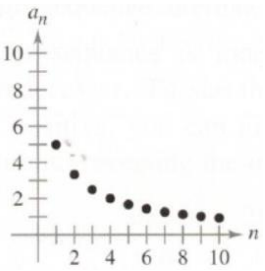

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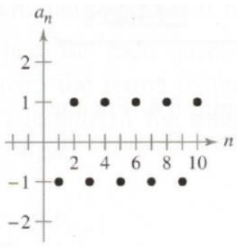

5. $a_n = \frac{10}{n+1}$

6. $a_n = \frac{10n}{n+1}$

7. $a_n = (-1)^n$

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

Write the next two apparent terms of the sequence. Describe the pattern you used to find these terms.

9. $2, 5, 8, 11, \ldots.$

10. $5, 10, 20, 40, \ldots$

Simplify the ratio of the factorials.

11. $\frac{(n+1)!}{n!}$

12. $\frac{(2n-1)!}{(2n+1)!}$

Find the limit (if possible) of the sequence with the given nth term.

13. $a_n = \frac{n+1}{n}$

14. $a_n = \frac{2n}{\sqrt{n^2+1}}$

Use your graphing calculator to graph the first 10 terms of the sequence with the given nth term. Use the graph to make an inference about the convergence or divergence of the sequence. Verify your inference analytically and, if the sequence converges, find its limit.

15. $a_n = \frac{4n+1}{n}$

16. $a_n = \frac{1}{n^{3/2}}$

17. $a_n = \sin\left(\frac{n\pi}{2}\right)$

18. $a_n = 2 - \frac{1}{4^n}$

Determine the convergence or divergence of the sequence with the given nth term. If the sequence converges, find its limit.

19. $a_n = \frac{5}{n+2}$

20. $a_n = 8 + \frac{5}{n}$

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

22. $a_n = \frac{1+(-1)^n}{n^2}$

23. $a_n = \frac{(n+1)!}{n!}$

24. $\frac{(n-2)!}{n!}$

25. $\mathrm{a_n} = \frac{\sin(n)}{n}$

26. $a_n = \cos\left(\frac{\pi n}{n^2}\right)$

Write an expression for the nth term of the sequence.

27. $1, -\frac{1}{4}, \frac{1}{9}, -\frac{1}{16}, \ldots$

28. $-2, 1, 6, 13, 22, \ldots$

29. $2, 1+\frac{1}{2}, 1+\frac{1}{3}, 1+\frac{1}{4}, 1+\frac{1}{5}, \ldots$

30. $\frac{1}{2\cdot 3}, \frac{2}{3\cdot 4}, \frac{3}{4\cdot 5}, \frac{4}{5\cdot 6}, \ldots$

Determine whether the sequence with the given nth term is monotonic and whether it is bounded. Use your graphing calculator to confirm your results.

31. $a_n = 4 - \frac{1}{n}$

32. $a_n = \frac{3n}{n+2}$

33. $a_n = \left(\frac{2}{3}\right)^n$

34. $a_n = \left(\frac{3}{2}\right)^n$

10.2 Worksheet

Find the sequence of partial sums S_1, S_2, S_3, S_4, and S_5.

1. $1+\frac{1}{4}+\frac{1}{9}+\frac{1}{16}+\frac{1}{25}+\cdots$

2. $\frac{1}{2*3}+\frac{2}{3*4}+\frac{3}{4*5}+\frac{4}{5*6}+\frac{5}{6*7}+\cdots$

3. $3-\frac{9}{2}+\frac{27}{4}-\frac{81}{8}+\frac{243}{16}+\cdots$

4. $1+\frac{1}{2}+\frac{1}{4}+\frac{1}{6}+\frac{1}{8}+\frac{1}{10}+\cdots$

Verify that the infinite series diverges.

5. $\sum_{n=0}^{\infty} 5\left(\frac{5}{2}\right)^n$

6. $\sum_{n=0}^{\infty} 4(-1.05)^n$

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

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

Verify that the infinite series converges.

9. $\sum_{n=0}^{\infty} \left(\frac{5}{6}\right)^n$

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

11. $\sum_{n=1}^{\infty} \frac{1}{n(n+1)}$

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

13. Find the sum of the series, use a graphing utility to find the indicated partial sum S_n and complete the table.

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

n	5	10	20	50	100
S_n					

Find the sum of the convergent series.

14. $\sum_{n=0}^{\infty} \left(-\frac{1}{5}\right)^n$

15. $\sum_{n=0}^{\infty} 5\left(\frac{2}{3}\right)^n$

16. $\sum_{n=1}^{\infty} \frac{1}{9n^2+3n-2}$

17. $\sum_{n=1}^{\infty} (\sin(1))^n$

Write the repeating decimal as a geometric series and write the sum of the series as a ratio of two integers.

18. $0.\overline{36}$

19. $0.\overline{81}$

Determine if the series is convergent or divergent.

20. $\sum_{n=0}^{\infty} \frac{3^n}{1000}$

21. $\sum_{n=0}^{\infty} (1.075)^n$

22. $\sum_{n=1}^{\infty} \ln\left(\frac{1}{n}\right)$

23. $\sum_{n=2}^{\infty} \frac{n}{\ln(n)}$

24. $\sum_{n=1}^{\infty} e^{-n}$

25. $\sum_{n=1}^{\infty} \left(1+\frac{k}{n}\right)^{n}$

10.3 Worksheet

Confirm that the integral test can be applied to the series, then use it to determine if the series converges or diverges.

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

2. $\sum_{n=1}^{\infty} \frac{2}{3n+5}$

3. $\sum_{n=1}^{\infty} e^{-n}$

4. $\sum_{n=1}^{\infty} ne^{-n/2}$

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

6. $\sum_{n=2}^{\infty} \frac{1}{n\sqrt{\ln(n)}}$

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

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

Explain why the integral test does not apply to the series.

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

10. $\sum_{n=1}^{\infty} e^{-n} \cos(n)$

11. $\sum_{n=1}^{\infty} \frac{2+\sin(n)}{n}$

12. $\sum_{n=1}^{\infty} \left(\frac{\sin(n)}{n}\right)^2$

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

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

14. $\sum_{n=1}^{\infty} \frac{1}{n^{1/2}}$

15. $\sum_{n=1}^{\infty} \frac{1}{n^{1/4}}$

16. $\sum_{n=1}^{\infty} \frac{1}{n^5}$

Use theorem 8.11 to determine the convergence or divergence of the p-series.

17. $1 + \frac{1}{2\sqrt{2}} + \frac{1}{3\sqrt{3}} + \frac{1}{4\sqrt{4}} + \cdots$

18. $\sum_{n=1}^{\infty} \frac{1}{n^{1.03}}$

10.4 Worksheet

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

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

2. $\sum_{n=1}^{\infty} \frac{1}{3n^2+2}$

3. $\sum_{n=2}^{\infty} \frac{1}{\sqrt{n}-1}$

4. $\sum_{n=0}^{\infty} \frac{4^n}{5^n+3}$

5. $\sum_{n=0}^{\infty} \frac{1}{n!}$

6. $\sum_{n=1}^{\infty} \frac{1}{4\sqrt[3]{n}-1}$

Use the Limit Comparison Test to determine the convergence or divergence of the series.

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

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

9. $\sum_{n=0}^{\infty} \frac{1}{\sqrt{n^2+1}}$

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

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

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

13. Which test (nth-Term Test, Geometric Series Test, p-Series Test, Telescoping Series Test, Integral Test, Direct Comparison Test, Limit Comparison Test) would you use to determine if the series converges or diverges? All must be used at least once.

a. $\sum_{n=1}^{\infty} \frac{\sqrt[3]{n}}{n}$

b. $\sum_{n=0}^{\infty} 5\left(-\frac{4}{3}\right)^n$

c. $\sum_{n=1}^{\infty} \frac{1}{5^n+1}$

d. $\sum_{n=2}^{\infty} \frac{1}{n^3-8}$

e. $\sum_{n=1}^{\infty} \frac{2n}{3n-2}$

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

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

h. $\sum_{n=1}^{\infty} \frac{3}{n(n+3)}$

10.5 Worksheet

Determine the convergence or divergence of the series.

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

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

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

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

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

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

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

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

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

10. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} * n^2}{n^2+4}$

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

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

13. $\sum_{n=1}^{\infty} \sin\left(\frac{(2n+1)\pi}{2}\right)$

14. $\sum_{n=1}^{\infty} \frac{1}{n}\cos(n\pi)$

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

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

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

18. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1}\sqrt{n}}{\sqrt[3]{n}}$

Approximate the sum of the series by using the first 6 terms.

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

20. $\sum_{n=1}^{\infty} \frac{4*(-1)^{n+1}}{\ln(n+1)}$

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

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

How many terms are required to approximate the series with an error of less than 0.001?

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

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

Determine whether the series converges absolutely, conditionally, or diverges.

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

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

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

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

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

30. $\sum_{n=2}^{\infty} \frac{(-1)^n*n}{n^3-5}$

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

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