

MAC2312
Suggested problems on Chapter 9 material
(infinite series)

Idris Mercer

April 6, 2018

1. Find a formula for the general term of the sequence.

$$1, \frac{1}{3}, \frac{1}{9}, \frac{1}{27}, \dots$$

2. Find a formula for the general term of the sequence.

$$1, -\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \dots$$

3. Find a formula for the general term of the sequence.

$$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \dots$$

4. Find a formula for the general term of the sequence.

$$\frac{1}{\pi^{1/2}}, \frac{4}{\pi^{1/3}}, \frac{9}{\pi^{1/4}}, \frac{16}{\pi^{1/5}}, \dots$$

- 5. (a)** Write out the first four terms of the sequence $\{1 + (-1)^n\}$, starting with $n = 0$.
- (b)** Write out the first four terms of the sequence $\{\cos n\pi\}$, starting with $n = 0$.
- (c)** Use the results in parts (a) and (b) to express the general term of the sequence $\{4, 0, 4, 0, \dots\}$ in two different ways, starting with $n = 0$.

6. Determine whether the sequence converges. If it converges, find its limit. Also write out the first five terms of the sequence.

$$\left\{ \frac{n}{n+2} \right\}_{n=1}^{\infty}$$

7. Determine whether the sequence converges. If it converges, find its limit. Also write out the first five terms of the sequence.

$$\left\{ n \sin \frac{\pi}{n} \right\}_{n=1}^{\infty}$$

8. Determine whether the sequence converges. If it converges, find its limit. Also write out the first five terms of the sequence.

$$\{1 + (-1)^n\}_{n=1}^{\infty}$$

9. Find an expression for the general term of the sequence. Determine whether the sequence converges. If it converges, find its limit.

$$\frac{1}{2}, \frac{3}{4}, \frac{5}{6}, \frac{7}{8}, \dots$$

10. Find an expression for the general term of the sequence. Determine whether the sequence converges. If it converges, find its limit.

$$\frac{1}{3}, -\frac{1}{9}, \frac{1}{27}, -\frac{1}{81}, \dots$$

11. Determine whether the sequence is strictly increasing, strictly decreasing, or neither.

$$\left\{ \frac{1}{n} \right\}_{n=1}^{\infty}$$

12. Determine whether the sequence is strictly increasing, strictly decreasing, or neither.

$$\left\{ \frac{n}{2n+1} \right\}_{n=1}^{\infty}$$

13. Determine whether the sequence is strictly increasing, strictly decreasing, or neither.

$$\left\{ \frac{10^n}{(2n)!} \right\}_{n=1}^{\infty}$$

14. Determine whether the series converges. If possible, find its sum.

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

15. Determine whether the series converges. If possible, find its sum.

$$\sum_{k=1}^{\infty} (-1)^{k-1} \frac{7}{6^{k-1}}$$

16. Determine whether the series converges. If possible, find its sum.

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

17. Determine whether the series converges. If possible, find its sum.

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

18. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} k^{-4/3}$$

19. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{1}{k^{1/4}}$$

20. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{1}{k^{\pi}}$$

21. Determine whether the series converges or diverges.

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

22. Determine whether the series converges or diverges.

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

23. Determine whether the series converges or diverges.

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

24. Determine whether the series converges or diverges.

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

25. Determine whether the series converges or diverges.

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

26. Determine whether the series converges or diverges.

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

27. Determine whether the series converges or diverges.

$$\sum_{k=5}^{\infty} 7k^{-1.01}$$

28. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{1}{5k^2 - k}$$

29. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{3}{k - \frac{1}{4}}$$

30. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{1}{3^k + 5}$$

31. Determine whether the series converges or diverges.

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

32. Determine whether the series converges or diverges.

$$\sum_{k=1}^{\infty} \frac{4k^2 - 2k + 6}{8k^7 + k - 8}$$

33. Determine whether the series converges or diverges.

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

34. Determine whether the series converges or diverges.

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

35. Determine whether the series converges or diverges.

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

36. Classify the series as absolutely convergent, conditionally convergent, or divergent.

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

37. Classify the series as absolutely convergent, conditionally convergent, or divergent.

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

38. Classify the series as absolutely convergent, conditionally convergent, or divergent.

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

39. Classify the series as absolutely convergent, conditionally convergent, or divergent.

$$\sum_{k=1}^{\infty} \sin \frac{k\pi}{2}$$