Section 2.1 Discussion: Rearrangements of Infinite Series
No objectives.

Section 2.2 The Limit of a Sequence
1. Understand the definition of a sequence.
2. Understand thoroughly the definition of convergence of a sequence.
3. Be able to write a proof that a specific sequence (such as \( \frac{2n+1}{n} \) ) converges to a specific limit (in this case, 2).
4. Be able to write the negation of a statement that has quantifiers.
5. Know the meaning of the phrase “The sequence \((a_n)\) is eventually in the set \(A\).”

Section 2.3 The Algebraic and Order Limit Theorems
1. Learn to write an \(\epsilon\) proof of the theorems that have limit statements in both the hypothesis and conclusion.
2. Be able to use the Order Limit Theorem.
3. Be able to use the Algebraic Limit Theorem.
4. Be able to use the theorem that every convergent sequence is bounded.
5. Be able to write an \(\epsilon\) proof that uses the “midway point” technique; (see proof of 2.3.3(iii) on page 47.)
6. Be able to write an \(\epsilon\) proof that uses the “worst-case estimate” technique; (see proof of 2.3.3(iv) on pages 47-48.)
7. Be able to write an \(\epsilon\) proof that uses the technique of choosing the maximum of \(N_1\) and \(N_2\) (see proof of 2.3.3(iv), page 48.)

Section 2.4 The Monotone Convergence Theorem and a first look at Infinite Series
1. Be able to state, prove, and use the Monotone Convergence Theorem.
2. Be able to state and use the Cauchy Condensation Test.
3. Know that \(\sum_{i=1}^{\infty} 1/n^p\) converges iff \(p > 1\).
4. Know the meaning of an infinite series and its sequence of partial sums, and the definition of convergence of an infinite series.
Section 2.5 Subsequences and the Bolzano-Weierstrass Theorem

1. Understand the meaning of subsequence and the meaning of the notation \((a_{n_j})\).

2. Be able to use Theorem 2.5.2: All subsequences of a convergent sequence converge to the same limit as the original sequence.

3. Be able to state and use the Bolzano-Weierstrass Theorem.

4. Be able to prove divergence by the technique of showing that two subsequences converge to different limits. (Example 2.5.4).

5. Be able to write a proof using the bisection technique (see proof of the Bolzano-Weierstrass Theorem, page 57.)

Section 2.6 The Cauchy Criterion

1. Know the definition of a Cauchy sequence.

2. Be able to prove that a convergent sequence is Cauchy. (Theorem 2.6.2)

3. Be able to prove that a Cauchy sequence (of real numbers) converges. (Lemma 2.6.3 and Theorem 2.6.4)

4. Know the acronyms AoC, NIP, MCT, BW, and CC. Know that these are all equivalent; any one of them could be chosen as an axiom and the other four would follow as theorems.

Section 2.7 Properties of Infinite Series

1. Be able to use the Cauchy condensation test (together with the geometric series test) to prove the p-test:

\[
\sum_{n=1}^{\infty} \frac{1}{n^p}
\]

converges iff \(p > 1\).

2. Be able to prove the comparison test for convergence of a series.

3. Be able to prove the absolute convergence test.

Sections 2.8 and 2.9 Double Summations and Products of Infinite Series, and Epilogue

None