Sequence and Series Review
Chapter 9 Sections 1 – 4

Section 1: Sequences and Series

- Use sequence notation to write the terms of sequences.
- Use factorials.
- Use summation notation to write sums.

Examples:

1. Write the first 5 terms of the sequence.

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

   b. $a_n = 2 - \frac{4}{n}$

2. Find the indicated term of the sequence.

   a. $a_n = \frac{8n}{n+1}$, find a_{13}

3. Write the expression for the apparent nth term of the sequence.

   a. $\frac{3}{2}, \frac{4}{4}, \frac{5}{8}, \frac{6}{16}, \frac{7}{32}, \cdots \quad a_n =$

   b. $-4, 8, -12, 16, -20, \ldots \quad a_n =$

4. Simplify the factorial expression.

   a. $\frac{3!\ \ 10!}{7!}$

5. Find the sum.

   a. $\sum_{i=1}^{7}(24 - 3i)$

   b. $\sum_{i=1}^{5}\frac{3}{i^2 - 2}$

   c. $\sum_{i=1}^{\infty}3\left(\frac{1}{10}\right)^i$

Other practice can be found on pages 649-650, problems 1-26, 37-49, 59-84, 99-106 and page 715, problems 1-18, 21-24

Section 2: Arithmetic Sequences and Partial Sums

- Recognize, write and find the *n*th term of arithmetic sequences.
- Find *n*th partial sums of arithmetic sequences.

Examples:

1. Determine if the sequence is arithmetic. If so, find the common difference.
   a. 97, 94, 91, 88, 85, …
   b. 1, 2, 4, 8, 16,…
2. Write the first 5 terms of the arithmetic sequence.
   a. $a_n = 2 - 5n$
3. Find the formula for a_n for the arithmetic sequence.
   a. $a_1 = 7, \quad d = 4$
   b. $5, \frac{11}{2}, 6\frac{13}{2}, 7, \ldots$
   c. $a_5 = 190, \quad a_{10} = 115$
4. Given $a_1 = 3, \quad a_2 = 13,$ find a_{21}
5. Find the partial sum.
   a. 40, 37, 34, 31,…, find S_{12}
   b. $\sum_{n=1}^{30} 6n$
6. Consider a job offer with the starting salary of $37,500 and an annual raise of $2,000.
   a. Determine the salary the 10th year of employment.
   b. Determine the total compensation from the company through six full years of employment.

Other practice can be found on pages 659-660, problems 1-48, 57-86
and pages 715-716, problems 27-48

Section 3: Geometric Sequences and Series

- Recognize, write and find the *n*th terms of geometric sequences.
- Find the *n*th partial sums of geometric sequences.
- Find the sum of an infinite geometric series.

Examples:

1. Determine whether the sequence is geometric. If so, find the common ratio.
   a. 7, 21, 63, 189, …
   b. 36, 27, 18, 9, …
2. Write the first five terms of the geometric sequence.
   a. $a_1 = 6, \quad r = \frac{1}{2}$
3. Write an expression for the nth term of the geometric sequence. Then find the indicated term.
   a. 5, 15, 45, 135, … find a_{12}
   b. $a_2 = 12, \quad a_5 = 768, \quad \text{find } a_{10}$
4. Find the sum of the finite geometric sequence.
   a. $\sum_{n=1}^{9} 25\left(-\frac{1}{2}\right)^{n-1}$
5. Find the sum of the infinite geometric sequence.
   a. $\sum_{n=0}^{\infty} 3(0.2)^n$
6. A deposit of $250 is made on the first day of each month in a savings account that pays 5% interest compounded monthly. Find the balance after 8 years. Example and formula can be found on page 668.

Other practice can be found on pages 669-671, problems 1-20, 27-42, 53-72, 79-88, 103 and page 716, problems 1-76, 78.

Section 4: Mathematical Induction

- Use mathematical induction to prove statements involving a positive integer n.
- Find the sums of powers of integers.

Examples:

1. Use mathematical induction to prove the formula for every positive integer n.
   a. $2^3 + 4^3 + 6^3 + \cdots + (2n)^3 = 2n^2(n+1)^2$
2. Find the sum using the formulas for the sums of powers of integers.
   a. $\sum_{n=1}^{15} (2n^3 + 4n)$

Other practice can be found on page 716, problems 79, 80, 87-90.