1	row 0
1 1	row 1
1 2 1	row 2
1 3 3 1	row 3
1 4 6 4 1	row 4
1 5 10 10 5 1	row 5
1 6 15 20 15 6 1	row 6
1 7 21 35 35 21 7 1	row 7

Unit 13.1-13.5 Sequences, Series, Induction, Binomial Theorem

By the end of this unit, you should be able to:

- ☐ write the first several terms of a sequence
- ☐ use summation notation
- ☐ find a formula for an arithmetic sequence
- ☐ find the sum of an arithmetic sequence
- ☐ find a formula for an geometric sequence
- ☐ find the sum of an geometric sequence
- ☐ determine if a sequence is arithmetic or geometric
- ☐ determine whether a geometric series converges or diverges
- ☐ solve annuity problems
- ☐ write a repeated decimal as a fraction
- ☐ prove statements use mathematical induction
- ☐ use the binomial theorem

Assignments:

13.1 – pg. 937 #9, 11, 13, 17, 19, 21, 27, 29, 33, 35, 37, 41, 49, 51, 53, 61, 63, 65
13.2 – pg. 944 #13, 15, 17, 21, 23, 27, 31, 35, 39, 47, 49, 51, 58, 61
13.3 – pg. 954 #9, 11, 13, 19-31odd, 33, 35, 37, 41, 45, 47, 49, 51, 55, 57, 67, 71, 77, 81, 85, 87, 89, 91
13.4 – pg. 960 #1-9odd
13.5 – pg. 966 #17, 21, 29, 31, 33, 35, 37

Review:

1. Write down the first 5 terms of the sequence.

   a) $\{b_n\} = \left\{(-1)^{n+1}(2n+3)\right\}$ b) $a_1 = -3 \quad a_n = 2 - a_{n-1}$

2. Write out the sum.

   $$\sum_{k=1}^{3}\left(3-k^2\right)$$

3. Express the sum using summation notation.

   $$2 + \frac{2^2}{3} + \frac{2^3}{3^2} + \ldots + \frac{2^{n+1}}{3^n}$$

4. Determine whether the given sequence is arithmetic, geometric, or neither. If the sequence is arithmetic, find the common difference and the sum of the first *n* terms. If the sequence is geometric, find the common ratio and the sum of the first *n* terms.

   a) $\{b_n\} = \{4n+3\}$ b) $\{d_n\} = \left\{2n^2 - 1\right\}$ c) $\{u_n\} = \left\{3^{2n}\right\}$

5. Find the sum.

   a) $\sum_{k=1}^{40}(-2k+8)$ b) -5, -1, 3, 7,…, 363.

6. Find the 98th term of 1, -1, -3, -5,...

7. Find the 9th term of $1, \frac{1}{10}, \frac{1}{100}, ...$

8. Write the explicit formula for the nth term of each sequences.

a) $\frac{1}{3}, \frac{4}{3}, 3, \frac{16}{3}, \frac{25}{3}, ...$

b) $-\frac{1}{4}, \frac{1}{8}, -\frac{1}{12}, \frac{1}{16}, -\frac{1}{20}, ...$

9. Find a general formula for the arithmetic sequence with an 8th term of -20 and a 17th term of -47.

10. Determine whether each infinite geometric series converges or diverges. If it converges, find its sum.

a) $6-4+\frac{8}{3}-\frac{16}{9}+...$

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

11. Use the Principle of Mathematical Induction to show that the given statement is true for all natural numbers.

$$3+6+9+...+3n=\frac{3n}{2}(n+1)$$

12. Find the coefficient of x^3 in the expansion of $(2x-3)^8$

13. Chris gets paid once a month and contributes $200 each pay period into his 401(k). If Chris plans on retiring in 20 years, what will be the value of his 401(k) if the per annum rate of return of the 401(k) is 10% compounded monthly?

14. Your friend has just been hired at an annual salary of $20,000. If she expects to receive annual increases of 4%, what will be her salary as she begins her fifth year?

15. What is the fraction form of .123123123123…