

Homework Assignment #2

Note that the questions with a star next to it is optional (extra credit) assignment. If you have storm server account, you can use the following command to print out this file from a storm terminal:

```
lpr ~zhang/public_html/cs1400/homework/hw_sequence.pdf
```

1 For the following sequence, fill in the next two terms of the sequence. Explain how you got it. Then provide a closed formula or recursive formula for the sequence.

a. 2, 9, 16, 23, 30,

b. 2, 8, 32, 128,

c. 1, 3, 7, 15, 31, 63,

2 For the following sequences specified with recursive formular, find the sequence's closed formular:

a.

$$a_1 = 3$$

$$a_n = a_{n-1} + 11$$

b.

$$b_1 = 2$$
$$b_n = 5b_{n-1}$$

3 Evaluate the following summation:

a.

$$\sum_{n=2}^5 (2n + 1)$$

b.

$$\sum_{n=3}^5 ((n-1)^2 + 1)$$

4 Express the following summations using the big sigma notations:

a. $3 + 14 + 25 + 36 + 47 + 58$

b. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16} + \frac{1}{32}$.

- 5 Compound interest arises when interest is added to the principal, so that from that moment on, the interest that has been added also itself earns interest. Suppose you open an account that pays a guaranteed fixed interest rate of 3%, compounded annually (every year). You make no further contributions; you just leave your money alone and let compound interest work its magic. Suppose that you deposit \$2000.0 (starting principal) into the account when you open it. In the second year, you have in your account:

$$2000.0 + 2000.0 \times 3\% = 2060.$$

In the third year, you have

$$2060 + 2060 \times 3\%$$

in your account, and so on. Let a_n represent the balance of your account in n -th year, we have $a_1 = 2000.0$.

Write the recursive formula for sequence a_n , and then derive the closed formular for a_n . Finally, calculate the account balance in 10 - th year, i.e., a_{10} .

6 Convert the following numbers to base 10 representation (i.e., decimal numbers):

a. $(11001)_2$

b. $(507)_8$ (Extra Credits: Also convert the number to binary).

c. $(2A0B)_{16}$ (Extra Credits: Also convert the number to binary).

7 Write the decimal number 136 in (note, b and c are extra credits problems)

a. Binary representation

b*. Octal representation (i.e., base 8)

c*. Hexadecimal representation (i.e., base 16)

8 As we studied in class, ASCII (American Standard Code for Information Interchange) is a character-encoding scheme originally based on the English alphabet that encodes 128 specified characters - the numbers 0-9, the letters a-z and A-Z, some basic punctuation symbols, some control codes that originated with Teletype machines, and a blank space - into the 7-bit binary integers. Write down the **7-bit binary numbers** that encode the following character, note that you can google about ASCII to obtain the encoding table.

a. space character

b. letter A

c. period (.)

c. character 3