

Discrete Functions Review

Make sure you have completed all homework questions.

A) Sequences: textbook questions: Pg. 480 #1 - 26

- Arithmetic: $a, a+d, a+2d, a+3d, \dots$; $t_n = f(n) = a + (n-1)d$
- Geometric: a, ar, ar^2, ar^3, \dots ; $t_n = f(n) = ar^{n-1}$
- Recursion Formulas
- Fibonacci Sequence
- Applications of Arithmetic & Geometric Sequences

Supplementary problems:

1) Given the formula for the n th term, write the first 3 terms of each sequence:

a) $t_n = -2n + 1$ b) $f(n) = \sqrt{n} + 2$ c) $t_n = \frac{1}{n}$

2) Find the twentieth term, t_{20} , for each sequence below:

a) 2, 4, 6, 8, ... b) 2, 4, 8, 16, ...

3) Determine the number of terms in the following sequence: 3, 15, 27, ..., 495.

4) In a geometric sequence, $t_3 = 36$ and $t_4 = 108$. Find the first three terms of the sequences and t_n .

5) Write the first four terms of each sequence:

a) $t_1 = 2$, $t_n = 3t_{n-1} + 5$ b) $t_1 = -1$, $t_2 = 1$, $t_n = 2t_{n-2} + 4t_{n-1}$

6) Represent the sequence 0, 3, 8, 15, 24, 35, ... using a recursion formula, function notation, and the formula for the n th term.

7) *Listeria monocytogenes* is a bacteria that rarely causes food poisoning. At a temperature of 10°C , it takes about 7 hours for the bacteria to double. If the bacteria count in a sample of food is 100, how long will it be until the count exceeds 1000 000?

B) Series: textbook questions: Pg. 484 #27 - 38

- Arithmetic: $S_n = \frac{n}{2}[2a + (n-1)d]$ or $S_n = \frac{n}{2}(a + t_n)$
- Geometric: $S_n = \frac{a(r^n - 1)}{r - 1}$
- Applications of Arithmetic & Geometric Series

Supplementary problems:

8) Find the sum of the first nine terms of this sequence. -9, -4, 1, 6, 11, ...

9) The first twenty terms of an arithmetic series have a sum of 770. The common difference is 3. What are the first three terms of the series?

10) Find the sum: $4 + 12 + 36 + \dots + 2916$

11) A snowball sentence is constructed so that each word has one more letter than the previous word. An example is, "I am not cold today."

a) Determine the total number of letters in the sentence (using series).

b) Write your own snowball sentence and determine the number of letters in your sentence.

C) Financial Applications: textbook questions: Pg. 572 #1 – 8, 11 – 12, 15, 17

• Simple Interest $I = Prt$

• Compound Interest $FV = PV(1+i)^n$ (solve problems using the formula)

• Annuities
$$FV = \frac{R[(1+i)^n - 1]}{i} \quad PV = \frac{R[1 - (1+i)^{-n}]}{i}$$

Supplementary problems:

12) You invest \$250 at 4% per annum at a bank that pays simple interest.

a) How much simple interest would be earned each year?

b) If you kept your money invested for 8 years, how much total simple interest would be earned?

c) How much money would be in your bank account after the 8 years if you did not withdraw any money?

d) If you doubled the principal, would it double the total interest paid over 8 years?

e) If you invested at double the interest rate, would it double the total interest paid over 8 years?

13) Meina is investing \$10 000 in a RRSP. She is considering a 9-year plan with an interest rate of 6% per annum, compounded semi-annually, or a 9-year plan with an interest rate of 5.95%, compounded monthly. Which plan should Meina choose? Justify your answer mathematically

14) Chamindu makes deposits of \$2000 annually into an account that pays 4% interest, compounded annually.

a) How much money will be in the account after a 15-year term?

b) How much interest will Chamindu have earned over the 15-year term?

15) Find the value of \$1000 invested each month for 2 years at 6%/a compounded monthly.

16) A small business has borrowed \$10 000 and must begin to repay it today. The payments are to be made at the end of every 6 months over a 5-year term. Interest on the loan is 9% compounded semi-annually. What will be the size of each regular payment?

17) A Canadian mortgage of \$95 400 has an interest rate of 8.75%/annum, a 5-year term, and an amortization period of 25 years.

a) Determine the equivalent interest rate.

b) Determine the monthly payment.

Answers to Supplementary Problems:

1) a) -1, -3, -5 b) 3, 3.414, 3.732 c) 1, $\frac{1}{2}$, $\frac{1}{4}$ 2) a) $t_{20}=40$ b) $t_{20}=1048576$ 3) $n = 42$

4) $t_n = 4(3)^{n-1}$ 5) a) 2, 11, 38, 119 b) $\tilde{1}, 1, 2, 10$ 6) $t_n = t_{n-1} + 2n - 1$; $f(n) = f(n-1) + 2n - 1$

7) 100 hours

8) $S_9=99$ 9) 10, 13, 16 10) $S_7=4372$ 11) a) 15 b) answers vary 12) a) \$10 b) \$80 c) \$330

12d) $I = (2P)rt$ ☹ Yes, the total interest earned would double e) $I = P(2r)t$ ☹ Yes, the total interest earned would double.

13) semi-annually: $A = 10000\left(1 + \frac{0.06}{2}\right)^{18} = \17024.33 ; monthly: $A = 10000\left(1 + \frac{0.0595}{12}\right)^{108} = \17060.43

14) a) \$40 047.18 b) \$10 047.18 15) \$25431.96 16) \$1263.79

17) (a) 0.007162 (b) \$774.27