

Test 4 Review

MATH 110 · Section 2 · Spring 2008

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Things you should know

4 Exponential and Log applications

- (a) For an exponential model $A = Pe^{rt}$, P is the initial amount (y -intercept) and r is the rate of growth ($r > 0$ is exponential growth and $r < 0$ is exponential decay).
- (b) How to calculate P and r given a quantity that grows/decays exponentially and then use the exponential model to make predictions/explanations.
- (c) How to use formulas that you are given in a question (including Newton's law of Cooling) to answer questions about a quantity.
- (d) What 'doubling time' and 'half-life' mean.

5.1 Sequences

- (a) How to find the n th term of a sequence given to you as a direct or recursive formula.
- (b) How to figure out what the next term of a sequence should be given the first few terms.
- (c) How to graph a sequence by plotting the points $(1, a_1)$, $(2, a_2)$, $(3, a_3)$, \dots

5.2 Summation

- (a) What sigma notation ($\sum_{k=1}^n a_k$) means and how to go back and forth between expanded sums and sums written in sigma notation.
- (b) Properties of sums and how to use them to write a sum in terms of simpler sums.
- (c) Factorials $n! = n(n-1)(n-2)\cdots 2 \cdot 1$.
- (d) How to use the summation formulas

$$\sum_{k=1}^n k = \frac{n(n+1)}{2} \quad \text{and} \quad \sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}$$

to evaluate sums of linear or quadratic sequences.

5.3 Arithmetic Sequences

- (a) A sequence is arithmetic if $a_{n+1} - a_n = d$ for all n . The constant d is called the common difference.
- (b) The n th term is $a_n = a_1 + (n-1)d$.
- (c) The graph of an arithmetic sequence is just a set of points on a linear function. The slope of the linear function equals the common difference of the sequence.
- (d) How to find the general formula for an arithmetic sequence given two terms of the sequence or the common difference and one term.
- (e) The sum of the first n terms of an arithmetic sequence is

$$S_n = \frac{n}{2}[2a_1 + (n-1)d] = n \left(\frac{a_1 + a_n}{2} \right)$$

5.4 Geometric Sequences

- (a) A sequence is geometric if $a_{n+1}/a_n = r$ for all n . The constant r is called the common ratio.
- (b) The n th term is $a_n = a_1 r^{n-1}$.
- (c) The graph of a geometric sequence is a set of points on an exponential function (or two exponential functions if $r < 0$).
- (d) How to find r and a_n given two terms in the sequence or one term and r .
- (e) The sum of the first n terms of a geometric series is

$$S_n = a_1 \left(\frac{1 - r^n}{1 - r} \right), r \neq 1.$$

(f) If $|r| < 1$ then we can find the infinite sum of a geometric series

$$\sum_{k=1}^{\infty} a_1 r^{k-1} = \frac{a_1}{1-r}.$$

Sources for Review Questions

- (1) Workbook: review questions 184-212 starting page 231
- (2) Other pages of the workbook that look relevant.
- (3) Textbook exercises/chapter test.
- (4) The final exam study guide questions towards the end of each of the three guides.