ASSOCIATION OF CANADA LANDS SURVEYORS - BOARD OF EXAMINERS
WESTERN CANADIAN BOARD OF EXAMINERS FOR LAND SURVEYORS
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SCHEDULE I / ITEM 1   **March 2004**
MATHEMATICS

Note: This examination consists of 10 questions on 1 page.   **Marks**

Q. No	Time: 3 hours	Value	Earned
1.a)	Given two arbitrary lines in the real plane, how can one check if they are parallel?	5	
b)	Given two arbitrary lines in three-dimensional space, how can one check if they are parallel?	5	
2.a)	What is the scalar or dot product of two given vectors $(1, 2, 4)^T$ and $(1, 3, 5)^T$?	5	
b)	What is the vector or cross product of two given vectors $(1, 2, 4)^T$ and $(1, 3, 5)^T$?	5	
3.a)	Given a complex sinusoid $f(z) = \sin z$, what are the magnitude (or modulus) and argument (or amplitude) of f(z)?	5	
b)	Given a complex logarithm $f(z) = \log z$, what are the real and imaginary parts of f(z)?	5	
4.a)	Given the equation $x^2 + 2y^2 + 9 = 0$ in the Cartesian (x,y) plane, what does it represent?	5	
b)	Given the equation $x^2 + y^2 + z^2 - 15 = 0$ in the Cartesian (x, y, z) space, what does it represent?	5	
5.a)	Does the series $1 + 1/3 + 1/5 + 1/7 + ...$ converge? Justify your answer.	5	
b)	Does the series $1 - 1/3 + 1/5 - 1/7 + ...$ converge? Justify your answer.	5	
6.a)	Given a small matrix $A = [a_{ij}]$ with elements $a_{ij} = i - j$, $i, j = 1, 2, 3$, what is its determinant?	5	
b)	What are the characteristic polynomial and eigenvalues or principal values of this matrix A?	5	
7.a)	What are symmetric and skew-symmetric matrices?	5	
b)	Given an arbitrary square matrix A, then A can be expressed as $A = B + C$, where B is symmetric and C is skew-symmetric. What are B and C in terms of A?	5	
8.a)	Given three equations $x + 2y + 3z = 8$, $x + 2y - z = 12$, $x - 2y - 3z = 4$, what are x, y and z using Cramer's rule?	5	
b)	What are x, y and z using Gaussian elimination with these three equations?	5	
9.a)	What is the definition of a Jacobian in coordinate transformations?	5	
b)	What is the difference between homogeneous and nonhomogeneous differential equations? Give some simple examples.	5	
10.a)	What are underdetermined, determined and overdetermined systems of linear algebraic equations? Give some simple examples.	5	
b)	Given an upper triangular system of linear algebraic equations, describe how to solve it using a simple example of order 4.	5	
	Total Marks:	100	