

ASSOCIATION OF CANADA LANDS SURVEYORS - BOARD OF EXAMINERS
WESTERN CANADIAN BOARD OF EXAMINERS FOR LAND SURVEYORS
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS

SCHEDULE I / ITEM 1
MATHEMATICS

October 2003

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

Q. No	Time: 3 hours	Marks	
		Value	Earned
1.a)	Given two arbitrary non-parallel lines in the real plane, how can one compute the angle of intersection?	5	
b)	Given the scalar or inner product of two unit vectors, what is the angle between them?	5	
2.a)	What is the vector orthogonal to two given vectors $(1, 2, 3)^T$ and $(4, 5, 6)^T$?	5	
b)	What is the projection of one vector $(1, 2, 3)^T$ onto another vector $(3, 5, 7)^T$?	5	
3.a)	For an arbitrary complex variable z , what are the real and imaginary parts of the complex function $f(z) = 1 + z^2$?	5	
b)	For an arbitrary complex variable z , what are the magnitude (or modulus) and argument (or amplitude) of the complex function $f(z) = 1 + z^2$?	5	
4.a)	What is the polar equation of a circle of radius 2 centered at (1,1)?	5	
b)	What is the polar equation of an ellipse with semi-major axis $a = 3$ and semi-minor axis $b = 2$ at the origin?	5	
5.a)	Expand the function $y = e^{2x}$ into a power series of x at $x = 0$. Give the first three terms only.	5	
b)	Expand the function $y = e^x$ into a power series of $x-1$ at $x = 1$. Give the first three terms only.	5	
6.a)	Given a small matrix $A = [a_{ij}]$ of order 3 with elements $a_{ij} = i + j$, what is its determinant?	5	
b)	What is the square of this matrix A ?	5	
7.a)	Given a small matrix $A = [a_{ij}]$ of order 2 with elements $a_{ij} = 1 + i + j$, what are its characteristic polynomial and eigenvalues or principal values?	5	
b)	What are the corresponding eigenvectors of this matrix A ?	5	
8.a)	Given three equations $x + y + z = 8$, $x + 2y - z = 2$, $x - y - 3z = 4$, 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 would be a simple differential equation for $f(x) = 1 + 2x + e^x$?	5	
b)	What is the general solution of $d^2y/dx^2 + 2y = 0$?	5	
10.a)	What is a singular matrix? Give a matrix example of order 3.	5	
b)	What is an hermitian matrix? Give a matrix example of order 3.	5	
Total Marks:		100	