

**CANADIAN BOARD OF EXAMINERS FOR PROFESSIONAL SURVEYORS
ATLANTIC PROVINCES BOARD OF EXAMINERS FOR LAND SURVEYORS**

**SCHEDULE I / ITEM 1
MATHEMATICS**

October 2008

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

Marks

Q. No

Time: 3 hours

Value Earned

Q. No		Value	Earned
1. a)	Given two distinct points (x_1, y_1) and (x_2, y_2) in the plane, what is the equation of the line specified by those two points?	5	
b)	Given three distinct noncollinear points (x_1, y_1) , (x_2, y_2) and (x_3, y_3) , what is the equation of the plane specified by those three points?	5	
2. a)	What is the slope of the normal to the previous $(x_1, y_1) - (x_2, y_2)$ line in the plane?	5	
b)	What is the direction of the normal to the previous $(x_1, y_1) - (x_2, y_2) - (x_3, y_3)$ plane in space?	5	
3. a)	Set up the definite integral to evaluate the area inside an ellipse with semi-major axis a and semi-minor axis b.	5	
b)	Set up the definite integral to evaluate the circumference of an ellipse with semi-major axis a and semi-minor axis b.	5	
4. a)	Given a small matrix $A = [a_{ij} \mid i, j = 1, 3]$, what is its determinant?	5	
b)	What is the characteristic polynomial for the small matrix $A = [a_{ij} \mid i, j = 1, 3]$?	5	
5. a)	Given a small rectangular matrix $B = [b_{ij} \mid i = 1, 2 \text{ and } j = 1, 3]$, what are its singular values?	5	
b)	What is called a singular value decomposition of such a rectangular matrix B?	5	
6. a)	Expand $(1 - 2x)^{1/2}$ as a series in powers of x. Give the first four terms only.	5	
b)	Expand $(x - 3)^{1/3}$ as a series in powers of x. Give the first four terms only.	5	
7. a)	For a complex variable $z = x + iy$, what are the real and imaginary parts of e^z ?	5	
b)	For a complex variable $z = x + iy$, what are the magnitude and argument of e^z ?	5	
8. a)	Given three linear equations: $x + 2y + 3z = 3$, $x + y - 2z = 5$, $x - 2y + z = 8$, evaluate x, y and z by Gaussian elimination.	5	
b)	Solve the preceding three equations for x, y and z using matrix algebra.	5	
9. a)	Given a differential equation: $du / dx - u = 1$, what is the general solution?	5	
b)	Given another differential equation: $d^2v / dx^2 - v = 2$, what is the general solution?	5	
10. a)	Given a partial differential equation: $\partial^2 u / \partial x^2 + \partial^2 u / \partial y^2 = 0$ for $u(x, y)$ in a Cartesian (x, y) system. How can the general solution $u(x, y)$ be evaluated?	5	
b)	Corresponding to this partial differential equation for $u(x, y)$, what is called a boundary value problem? Give a simple example.	5	
Total Marks:		100	