

University of Maryland, College Park
Department of Civil & Environmental Engineering

Quiz 1, Closed Book & Notes, for 15 minutes
February 28, 2001

ENCE 203 - Computation Methods in Civil Engineering II Name: _____

Problem 1

Find the eigenvalues (λ 's) resulting from the following matrix:

$$A = \begin{bmatrix} 1 & 0 & 0 \\ 8 & 1 & 1 \\ 4 & 1 & 1 \end{bmatrix}$$

NOTE: $|A - \lambda I| = 0$

*** SOLUTION ***

$$|A - \lambda I| = \begin{vmatrix} 1 & 0 & 0 \\ 8 & 1 & 1 \\ 4 & 1 & 1 \end{vmatrix} - \begin{vmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{vmatrix} = \begin{vmatrix} (1-\lambda) & 0 & 0 \\ 8 & (1-\lambda) & 1 \\ 4 & 1 & (1-\lambda) \end{vmatrix} = (1-\lambda)[(1-\lambda)^2 - 1] = 0$$

$$(1-\lambda)[1 - 2\lambda + \lambda^2 - 1] = 0$$

$$(1-\lambda)[\lambda(\lambda - 2)] = 0$$

$$\lambda(1-\lambda)(\lambda - 2) = 0 \quad \Rightarrow \quad \lambda = 0, 1, \text{ and } 2$$