

1. The Hessian matrix is *symmetric*.

2. No. The equation for the eigenvalues will be  $(1-\lambda)^2 - 1 = 0$ , with solutions  $\lambda_{1,2} = 1 \pm 1$ , i.e. 0 and 2. Thus, not all eigenvalues are positive, meaning that the matrix is not positive definite. It is, however, positive semi-definite, since all eigenvalues are non-negative.

3. Yes, this is TRUE. No matter the dimensionality of the vector  $\mathbf{x}$ , once the search direction has been inserted, the resulting equation depends only on the step length ( $\eta$ ) (see e.g. Eqs.(2.30) and (2.31) in the book).