

1. Which property applies to the Hessian matrix H (of a function f)? Pick one answer!

A. It is symmetric

B. Only the diagonal elements are non-zero

C. All its elements are always non-zero

YES

NO

2. Consider a 2×2 matrix in which all elements are equal to 1.

Is this matrix positive definite?

TRUE

FALSE

3. In an iterative method, once the search direction has been found, the problem of finding a suitable step length is one-dimensional.

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 (η) (see e.g. Eqs.(2.30) and (2.31) in the book).