Step-1

State true or false:

(a) Differential equation $\frac{du}{dt} = Au$ has a solution for every matrix *A*, starting from $u(0) = (1,1,\ldots,1)$.

This statement is true. The solution to the differential equation is $u(t) = e^{At}u(0)$, this depends on the exponential of *A* and e^{At} is never singular. If matrix *A* could not be diagonalize then Jordan form can be used which involves generalised Eigen vectors.

Step-2

(b) Every invertible matrix can be diagonalize.

This statement is $\boxed{\text{false}}$. Diagonalisation depends only on number of Eigen vectors corresponding to the Eigen values.

Step-3

(c) Every diagonalizable matrix can be inverted.

This statement is $\boxed{\text{false}}$. Invertibility is concerned with Eigen values whether it is zero or not. It has no connection with diagonalization of the matrix.

Step-4

(d) Exchanging the rows of a 2 by 2 matrix reverses the signs of its Eigen values.

This statement is false. Exchanging the rows changes the equation $\det(A - \lambda I) = 0$. Thereafter Eigen values are also changed.

Step-5

(e) If Eigen vectors *x* and *y* correspond to distinct Eigen values then $x^H y = 0$.

This statement is false. Recall that The Eigen values of a Hermitian matrix are orthogonal provided they correspond to different Eigen values. So, if the matrix is Hermitian matrix then only $x^H y = 0$.