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## THE EQUATION $XA + AX^* = 0$ AND THE DIMENSION OF \*CONGRUENCE ORBITS\*

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Abstract. We solve the matrix equation  $XA + AX^* = 0$ , where  $A \in \mathbb{C}^{n \times n}$  is an arbitrary given square matrix, and we compute the dimension of its solution space. This dimension coincides with the codimension of the tangent space of the \*congruence orbit of A. Hence, we also obtain the (real) dimension of \*congruence orbits in  $\mathbb{C}^{n \times n}$ . As an application, we determine the generic canonical structure for \*congruence in  $\mathbb{C}^{n \times n}$  and also the generic Kronecker canonical form of \*palindromic pencils  $A + \lambda A^*$ .

**Key words.** Canonical forms for \*congruence, \*Congruence, Codimension, Matrix equations, Orbits, \*Palindromic pencils.

AMS subject classifications. 15A24, 15A21.

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