

14. True or False. If the statement is true, then PROVE the statement. If the statement is false, then give a COUNTEREXAMPLE. If  $A$  and  $B$  are  $2 \times 2$  symmetric matrices, then  $AB$  is a symmetric matrix.

False  $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$   $B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

$A$  and  $B$  are symmetric

but  $AB = \begin{bmatrix} 2 & 4 \\ 1 & 2 \end{bmatrix}$  which is not symmetric

15. True or False. If the statement is true, then PROVE the statement. If the statement is false, then give a COUNTEREXAMPLE. If  $A$  and  $B$  are  $2 \times 2$  nonsingular matrices, then  $AB$  is a nonsingular matrix.

True We know that  $A$  and  $B$  have inverses  
 Thus  $AB$  also has an inverse namely  $B^{-1}A^{-1}$   
 Thus  $AB$  is non-singular