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Let A and B be nxn matrices. Prove that AB is invertible and $(AB)^{-1} = B^{-1}A^{-1}$.?

Let A and B be nxn matrices. Prove that AB is invertible and $(AB)^{-1} = B^{-1}A^{-1}$. Thank you in advance.

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Answers



Best Answer: We cannot prove that AB is invertible unless we know that A and B are both invertible.

So assuming that A and B are both invertible, then there exist A^{-1} and B^{-1} such that:

$$A A^{-1} = A^{-1} A = I$$

$$B B^{-1} = B^{-1} B = I$$

$$\begin{aligned} (AB) (B^{-1}A^{-1}) &= A (B B^{-1}) A^{-1} \\ &= A I A^{-1} \\ &= A A^{-1} \\ &= I \end{aligned}$$

$$\begin{aligned} (B^{-1}A^{-1}) (AB) &= B^{-1} (A^{-1}A) B \\ &= B^{-1} I B \\ &= B^{-1} B \\ &= I \end{aligned}$$

Since $(AB)(B^{-1}A^{-1}) = (B^{-1}A^{-1})(AB) = I$, then $(B^{-1}A^{-1}) = (AB)^{-1}$

[Mathmom](#) · 7 years ago



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