

LÖSUNG DER AUFGABEN VOM 28.09.2018

$$1/a) \begin{pmatrix} 2 & 3 & -1 & | & 1 & 0 & 0 \\ 1 & -2 & 4 & | & 0 & 1 & 0 \\ 2 & 2 & -4 & | & 0 & 0 & 1 \end{pmatrix} \begin{array}{l} 2 \cdot \text{II} - \text{I} \\ \text{I} - \text{III} \end{array}$$

$$\begin{pmatrix} 2 & 3 & -1 & | & 1 & 0 & 0 \\ 0 & -7 & 9 & | & -1 & 2 & 0 \\ 0 & 1 & 3 & | & 1 & 0 & -1 \end{pmatrix} 7 \cdot \text{III} + \text{II}$$

$$\begin{pmatrix} 2 & 3 & -1 & | & 1 & 0 & 0 \\ 0 & -7 & 9 & | & -1 & 2 & 0 \\ 0 & 0 & 30 & | & 6 & 2 & -7 \end{pmatrix} \begin{array}{l} \text{I} + \frac{1}{30} \cdot \text{III} \\ \text{III} - \frac{10}{3} \cdot \text{II} \end{array}$$

$$\begin{pmatrix} 2 & 3 & 0 & | & \frac{6}{5} & \frac{1}{15} & -\frac{7}{30} \\ 0 & \frac{70}{3} & 0 & | & \frac{28}{3} & -\frac{14}{3} & -7 \\ 0 & 0 & 30 & | & 6 & 2 & -7 \end{pmatrix} \text{I} - \frac{9}{70} \cdot \text{II}$$

$$\begin{pmatrix} 2 & 0 & 0 & | & 0 & \frac{2}{3} & \frac{2}{3} \\ 0 & \frac{70}{3} & 0 & | & \frac{28}{3} & -\frac{14}{3} & -7 \\ 0 & 0 & 30 & | & 6 & 2 & -7 \end{pmatrix} \begin{array}{l} :2 \\ : \frac{70}{3} \\ :30 \end{array}$$

$$\begin{pmatrix} 1 & 0 & 0 & | & 0 & \frac{1}{3} & \frac{1}{3} \\ 0 & 1 & 0 & | & \frac{2}{5} & -\frac{1}{5} & -\frac{3}{10} \\ 0 & 0 & 1 & | & \frac{1}{5} & \frac{1}{15} & -\frac{7}{30} \end{pmatrix}$$

$$\Rightarrow A^{-1} = \begin{pmatrix} 0 & \frac{1}{3} & \frac{1}{3} \\ \frac{2}{5} & -\frac{1}{5} & -\frac{3}{10} \\ \frac{1}{5} & \frac{1}{15} & -\frac{7}{30} \end{pmatrix}$$

$$b) \left(\begin{array}{ccc|ccc} 5 & 2 & 1 & 1 & 0 & 0 \\ 1 & 4 & 2 & 0 & 1 & 0 \\ 1 & 2 & 4 & 0 & 0 & 1 \end{array} \right) \begin{array}{l} I - 5 \cdot II \\ I - 5 \cdot III \end{array}$$

$$\left(\begin{array}{ccc|ccc} 5 & 2 & 1 & 1 & 0 & 0 \\ 0 & -18 & -9 & 1 & -5 & 0 \\ 0 & -8 & -19 & 1 & 0 & -5 \end{array} \right) 2,25 \cdot III - II$$

$$\left(\begin{array}{ccc|ccc} 5 & 2 & 1 & 1 & 0 & 0 \\ 0 & -18 & -9 & 1 & -5 & 0 \\ 0 & 0 & -33,75 & 1,25 & 5 & -11,25 \end{array} \right) \begin{array}{l} III + 33,75 \cdot I \\ III - 3,75 \cdot I \end{array}$$

$$\left(\begin{array}{ccc|ccc} 168,75 & 67,5 & 0 & 35 & 5 & -11,25 \\ 0 & 67,5 & 0 & -2,5 & 23,75 & -11,25 \\ 0 & 0 & -33,75 & 1,25 & 5 & -11,25 \end{array} \right) I - II$$

$$\left(\begin{array}{ccc|ccc} 168,75 & 0 & 0 & 37,5 & -18,75 & 0 \\ 0 & 67,5 & 0 & -2,5 & 23,75 & -11,25 \\ 0 & 0 & -33,75 & 1,25 & 5 & -11,25 \end{array} \right) \begin{array}{l} : 168,75 \\ : 67,5 \\ : (-33,75) \end{array}$$

$$\left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 2/9 & -1/9 & 0 \\ 0 & 1 & 0 & -1/27 & 19/54 & -1/6 \\ 0 & 0 & 1 & -1/27 & -4/27 & 1/3 \end{array} \right)$$

$$\Rightarrow A^{-1} = \begin{pmatrix} 2/9 & -1/9 & 0 \\ -1/27 & 19/54 & -1/6 \\ -1/27 & -4/27 & 1/3 \end{pmatrix}$$

$$2) a) A^{-1} = \begin{pmatrix} 1/4 & -1/12 & 0 \\ 7/32 & -9/32 & -1/8 \\ 3/16 & -7/48 & -1/4 \end{pmatrix}$$

$$b) A^{-1} = \begin{pmatrix} 7/25 & -2/75 & 16/75 \\ 4/25 & -19/75 & 2/75 \\ 3/25 & -8/75 & -11/75 \end{pmatrix}$$

$$3) A^{-1} = \begin{pmatrix} 0,8 & -0,2 \\ -0,6 & 0,4 \end{pmatrix}$$

$$a) \begin{pmatrix} 0,8 & -0,2 \\ -0,6 & 0,4 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0,8 \\ -0,6 \end{pmatrix}$$

$$b) \begin{pmatrix} 0,8 & -0,2 \\ -0,6 & 0,4 \end{pmatrix} \cdot \begin{pmatrix} 3 \\ -1 \end{pmatrix} = \begin{pmatrix} 2,6 \\ -2,2 \end{pmatrix}$$

$$4) \left(\begin{array}{cc|cc} a & b & 1 & 0 \\ c & d & 0 & 1 \end{array} \right) c \cdot I - a \cdot II$$

$$\left(\begin{array}{cc|cc} a & b & 1 & 0 \\ 0 & cb-ad & c & -a \end{array} \right) (cb-ad) \cdot I - b \cdot II$$

$$\left(\begin{array}{cc|cc} a \cdot (cb-ad) & 0 & cb-ad-bc & ba \\ 0 & cb-ad & c & -a \end{array} \right)$$

$$\left(\begin{array}{cc|cc} a \cdot (cb-ad) & 0 & -ad & ba \\ 0 & cb-ad & c & -a \end{array} \right) \begin{array}{l} : (cb-ad) \\ : (cb-ad) \end{array}$$

$$\left(\begin{array}{cc|cc} a & 0 & -\frac{ad}{cb-ad} & \frac{ba}{cb-ad} \\ 0 & 1 & \frac{c}{cb-ad} & \frac{-a}{cb-ad} \end{array} \right) : a$$

$$\left(\begin{array}{cc|cc} 1 & 0 & \frac{-d}{cb-ad} & \frac{b}{cb-ad} \\ 0 & 1 & \frac{c}{cb-ad} & \frac{-a}{cb-ad} \end{array} \right) \left| \begin{array}{l} \\ cb-ad = -(ad-bc) \end{array} \right.$$

$$\left(\begin{array}{cc|cc} 1 & 0 & \frac{d}{ad-bc} & \frac{-b}{ad-bc} \\ 0 & 1 & \frac{-c}{ad-bc} & \frac{a}{ad-bc} \end{array} \right) \checkmark$$

$$5) \left(\begin{array}{cc|cc} 6 & -4 & 1 & 0 \\ -9 & 6 & 0 & 1 \end{array} \right) \begin{array}{l} \\ 1,5 \cdot \text{I} + \text{II} \end{array}$$

$$\left(\begin{array}{cc|cc} 6 & -4 & 1 & 0 \\ 0 & 0 & 1,5 & 1 \end{array} \right)$$

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$$6) a) M = \begin{pmatrix} 0,8 & 0,15 & 0,12 \\ 0,1 & 0,7 & 0,08 \\ 0,1 & 0,15 & 0,8 \end{pmatrix}$$

b) ①

$$M^{-1} \cdot \begin{pmatrix} 3000 \\ 3000 \\ 4000 \end{pmatrix} \approx \begin{pmatrix} 2494 \\ 3468 \\ 4038 \end{pmatrix}$$

$$M^{-1} \cdot \begin{pmatrix} 2494 \\ 3468 \\ 4038 \end{pmatrix} \approx \begin{pmatrix} 1716 \\ 4248 \\ 4037 \end{pmatrix}$$

$$\text{oder } M^{-1} \cdot M^{-1} \cdot \begin{pmatrix} 3000 \\ 3000 \\ 4000 \end{pmatrix}$$