|  |  |
| --- | --- |
|  | tud_logo |
|  | Mathematikstützkurs für Maschinenbau |
|  |  |
|  |  |
|  | Musterlösung – Arbeitsblatt Matrizenrechnung |
|  |  |

# Aufgabe 1

a) 

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 3 | 2 | 1 | 2 | 34 | 12 | 16 |
| 4 | 2 | 2 | 0 | 0 | 40 | 8 | 24 |
| 0 | 3 | 0 | 2 | 5 | 25 | 18 | 4 |
|  |  |  |  | 0 | 5 | 1 | 3 |
|  |  |  |  | 1 | 7 | 4 | 2 |
|  |  |  |  | -1 | 3 | -2 | 4 |
|  |  |  |  | 1 | 2 | 3 | -1 |





|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 0 | 5 | 1 | 3 | 14 | 14 | 2 |
| 1 | 7 | 4 | 2 | 30 | 27 | 11 |
| -1 | 3 | -2 | 4 | -2 | 1 | -7 |
| 1 | 2 | 3 | -1 | 16 | 13 | 9 |
|  |  |  |  | 0 | 1 | 3 |
|  |  |  |  | 2 | 0 | 0 |
|  |  |  |  | 4 | 5 | 2 |
|  |  |  |  | 0 | 3 | 0 |



b) 

# Aufgabe 2

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  |  | | --- | --- | --- | --- | | -1 | 2 | 5 | 0 | | 2 | 0 | -2 | 4 | | 1 | -3 | -7 | -1 | | 3 | 1 | -1 | 7 | | -1 | 2 | 5 | 0 | | 0 | -6 | -12 | -6 | | 0 | -1 | -2 | -1 | | 0 | -10 | -20 | -10 | | 1 | 2 | 5 | 0 | | 0 | -6 | -12 | -6 | | 0 | 0 | 0 | 0 | | 0 | 0 | 0 | 0 |                |  |  |  | | --- | --- | --- | | 1 | -2 | -2 | | 1 | 1 | a | | 2 | a-1 | -2 | | 1 | -2 | -2 | | 0 | -3 | -2-a | | 0 | -a-3 | -2 | | 1 | -2 | -2 | | 0 | -3 | -2-a | | 0 | 0 | a² +5a | | |  |  |  | | --- | --- | --- | | 1 | -2 | 2 | | 1 | 0 | 1 | | -1 | 1 | -3 | | 1 | -2 | 2 | | 0 | -2 | 1 | | 0 | -1 | -1 | | 1 | -2 | 2 | | 0 | -2 | 1 | | 0 | 0 | 3 | |

# Aufgabe 3



Per Definition hat eine  mit einer Determinanten  den Rang !





Hier ist die Determinante. Daher muss der Rang  sein.

Matrix in Stufenform umrechnen ergibt: 

Rang () < 3



# Aufgabe 4



Nullstellen suchen:

Eine Lösung raten:  , Horner-Schema anwenden:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | -1 | 6 | -11 | 6 |
|  | 0 | -2 | 8 | -6 |
|  | -1 | 4 | -3 | 0 |



Weiteres auflösen, z.B. mit p-q-Formel ergibt: 



auflösen liefert: 

Nullstellen suchen: Eine Lösung raten: 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | -1 | 3 | 9 | -27 |
|  | 0 | -3 | 0 | 27 |
|  | -1 | 0 | 9 | 0 |



# Aufgabe 5

Wie der Aufgabenstellung zu entnehmen ist, ist die Kamera vom Schwerpunkt des Fahrzeugs um 2m in Längsrichtung und 0,3m in Querrichtung entfernt installiert. Dadurch lautet die Abbildungsmatrix der Translation folgendermaßen aus:

Zusätzlich ist die Kamera entlang der Horizontalen um 2° von der Fahrzeuglängsachse gedreht. Daher lautet die Rotationsmatrix:

Die Abbildungsmatrix lautet somit insgesamt: