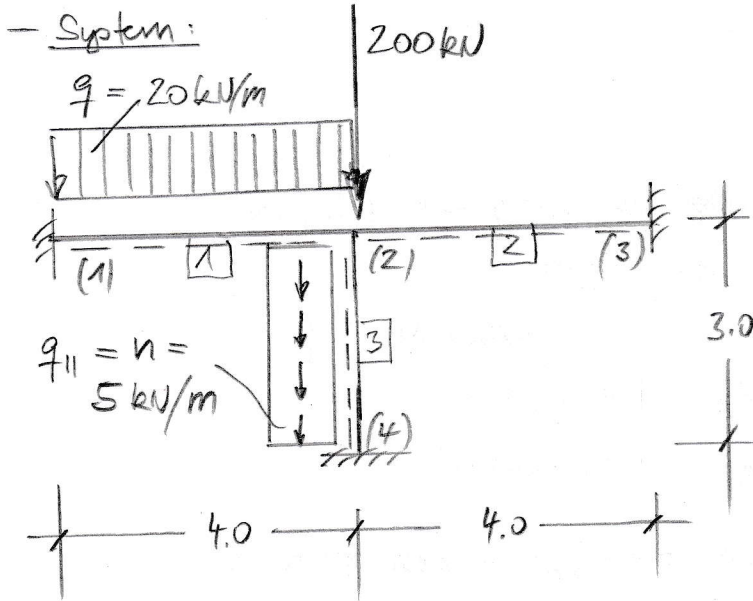


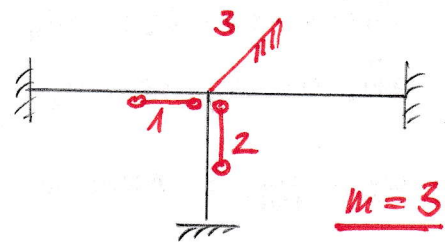
Übungsbeispiel 4 : WGV (mit Handrechnung)



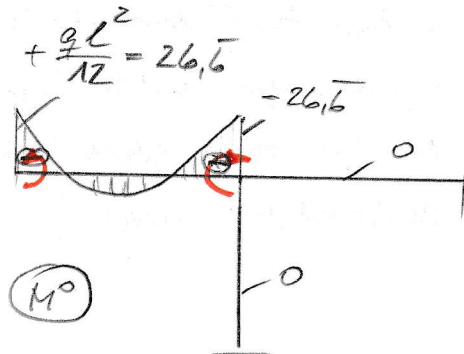
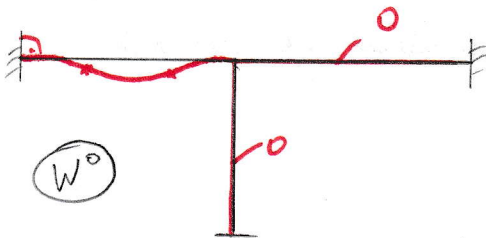
- Inzidenz-
tafel :

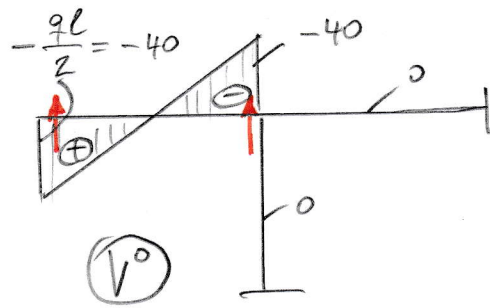
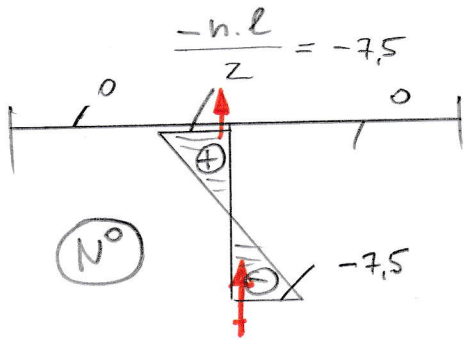
i	a	e	l	β	EJ	EA
1	1	2	4.0	0	4000	100000
2	2	3	4.0	0	6000	100000
3	2	4	3.0	-90°	3000	30000

- Kinem. best. Hauptsystem



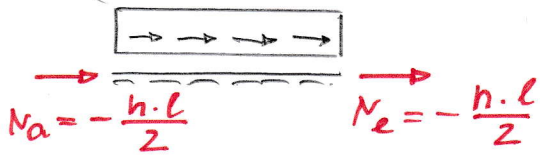
- Lastverformungszustand



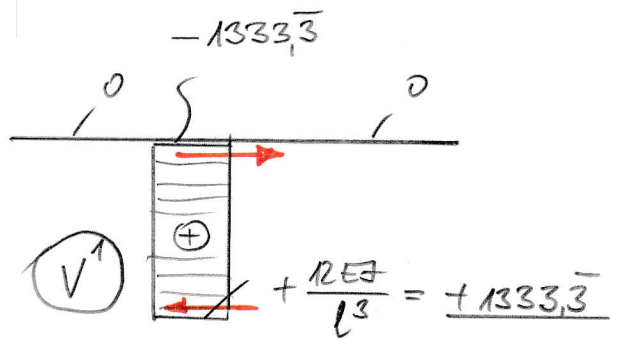
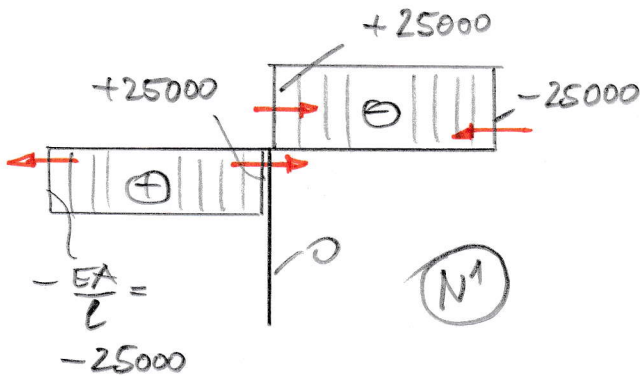
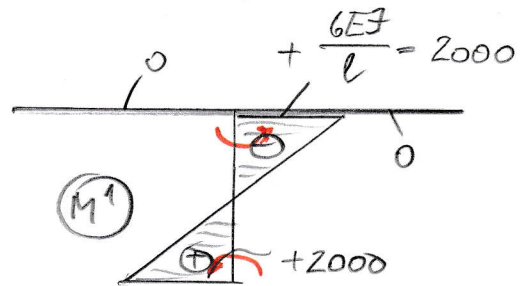
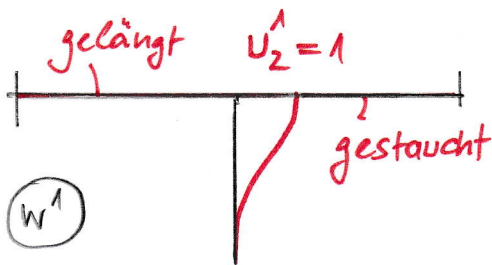


vgl. Schneider 4.1 Tab. 1.1.4

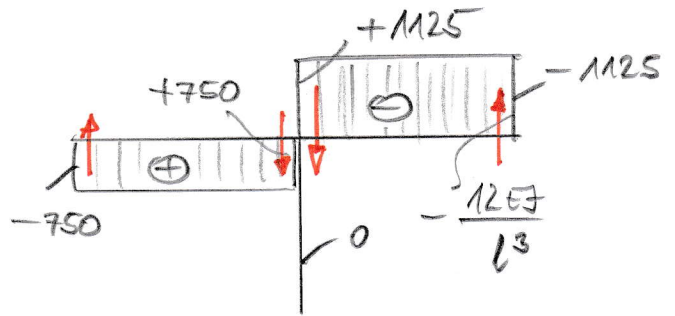
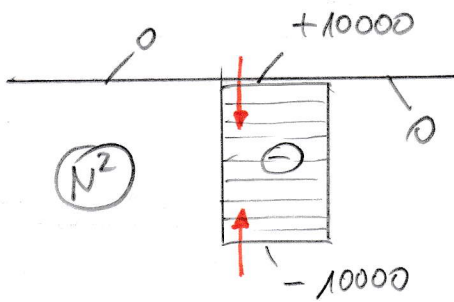
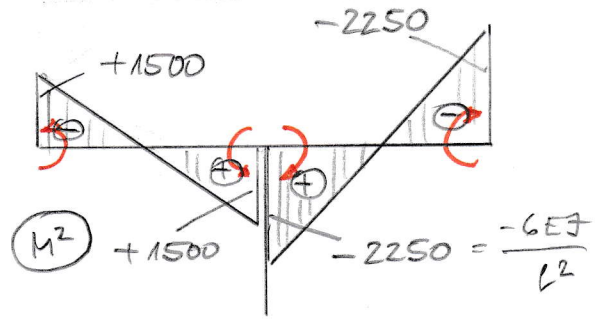
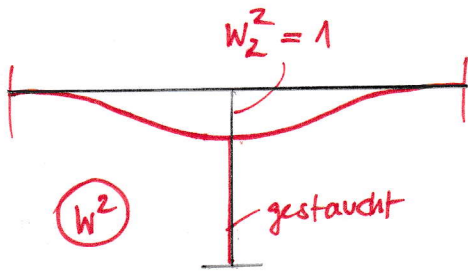
(a) (c)



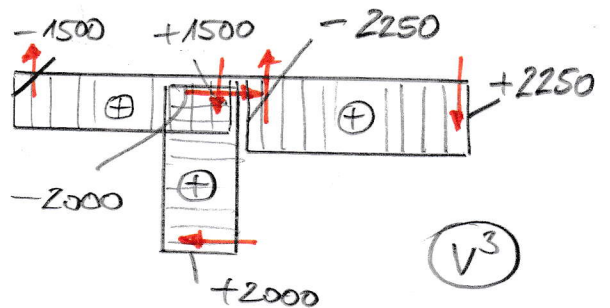
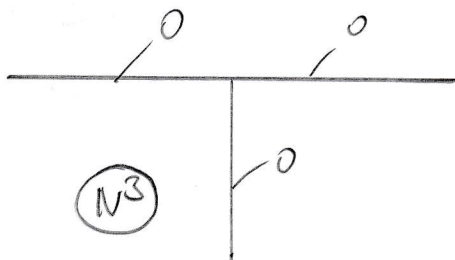
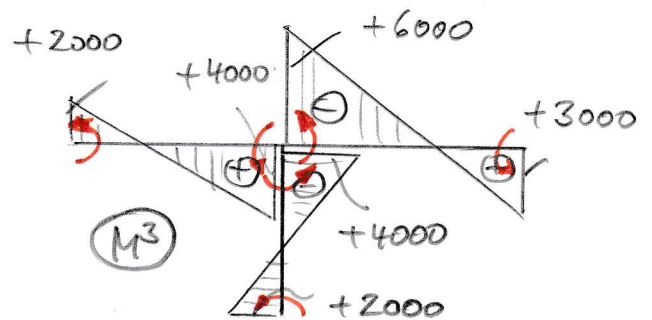
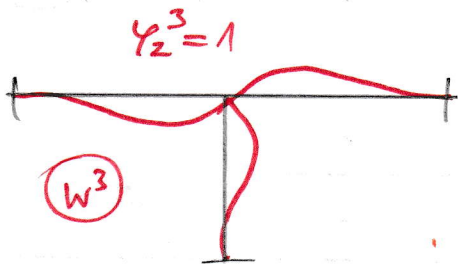
- EVZ1 (Wegfessel am Kn. 2 in horiz. Richtung)



- EVZ 2 : (Wegfessel am Kn. 2 in vertikaler Richt.)



- EVZ 3 : (Drehfessel am Kn. 2)



gleichgewichtsbedingungen ($m=3$)

$$\sum K_{x,2} \stackrel{!}{=} 0 : 0 + y_1 (25000 + 25000 + 1333,3) + y_2 \cdot (0) + y_3 (2000) = 0$$

$$\sum K_{z,2} \stackrel{!}{=} 0 : (-200 - 40 - 7,5) + y_1 (0) + y_2 (10000 + 750 + 1125) + y_3 (1500 - 2250) = 0$$

$$\sum M_2 \stackrel{!}{=} 0 : -26,6 + y_1 (2000) + y_2 (1500 - 2250) + y_3 (6000 + 4000 + 4000) \stackrel{!}{=} 0$$

→ in Matrixform:

$$\begin{bmatrix} 51333,3 & 0 & 2000 \\ 0 & 11875 & -750 \\ 2000 & -750 & 14000 \end{bmatrix} \cdot \begin{bmatrix} y_1 \\ y_2 \\ y_3 \end{bmatrix} = \begin{bmatrix} 0 \\ 247,5 \\ 26,6 \end{bmatrix}$$

Lösung und Superposition $z_i = z^0 + \sum_{n=1}^3 y_n \cdot z^n$

Lösung des Gleichungssystems $[K] \cdot [y] = [r]$

$[K]$ = Steifigkeitsmatrix (pos. Definit + symmetrisch)

51333,333	0,000	2000,000
0,000	11875,000	-750,000
2000,000	-750,000	14000,000

$[r]$ = Lastvektor (recht Seite)

0,000
247,500
26,667

$[K]^{-1}$ = Inverse Steifigkeitsmatrix

1,959E-05	-1,774E-07	-2,808E-06
-1,774E-07	8,450E-05	4,552E-06
-2,808E-06	4,552E-06	7,207E-05

$[y]$ = Lösungsvektor

-1,188E-04
2,103E-02
3,049E-03

entspricht:

u_2
w_2
ϕ_2

Nachlaufrechnung (Superposition)

mit Hilfe einer einfachen Matrizenmultiplikation

Stabend- (Vorzeichen nach WGV)

schnittgrößen

1,000000
-0,000119
0,021035
0,003049

	am LVZ	am EVZ1	am EVZ2	am EVZ3		nach Baustatik
M _{1,rechts}	26,667	0,000	1500,000	2000,000	64,316	-1 -64,316
M _{2,links}	-26,667	0,000	1500,000	4000,000	17,080	1 17,080
M _{2,rechts}	0,000	0,000	-2250,000	6000,000	-29,036	-1 29,036
M _{3,links}	0,000	0,000	-2250,000	3000,000	-38,182	1 -38,182
M _{2,unten}	0,000	2000,000	0,000	4000,000	11,957	-1 -11,957
M _{4,oben}	0,000	2000,000	0,000	2000,000	5,860	1 5,860
V _{1,rechts}	-40,000	0,000	-750,000	-1500,000	-60,349	-1 60,349
V _{2,links}	-40,000	0,000	750,000	1500,000	-19,651	1 -19,651
V _{2,rechts}	0,000	0,000	1125,000	-2250,000	16,805	-1 -16,805
V _{3,links}	0,000	0,000	-1125,000	2250,000	-16,805	1 -16,805
V _{2,unten}	0,000	-1333,333	0,000	-2000,000	-5,939	-1 5,939
V _{4,oben}	0,000	1333,333	0,000	2000,000	5,939	1 5,939
N _{1,rechts}	0,000	-25000,000	0,000	0,000	2,969	-1 -2,969
N _{2,links}	0,000	25000,000	0,000	0,000	-2,969	1 -2,969
N _{2,rechts}	0,000	25000,000	0,000	0,000	-2,969	-1 2,969
N _{3,links}	0,000	-25000,000	0,000	0,000	2,969	1 2,969
N _{2,unten}	-7,500	0,000	10000,000	0,000	202,846	-1 -202,846
N _{4,oben}	-7,500	0,000	-10000,000	0,000	-217,846	1 -217,846

