Problem 9

Figure

10 lbf

kr = 10 000 lbf-in/rad

10 "

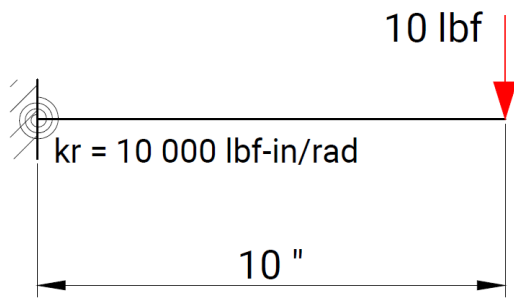### Description

A cantilever beam of length 10 inches is subjected to a vertical concentrated load of P = 10 lbf at its free end.

The fixed end of the beam is supported by a rotational spring with stiffness kr = 10 000 lbf-in/rad

Determine:

- The displacements at the free end (node 2)

Model

Units:	in, kips
Element:	Beam element
Material:	E = 30 000 ksi
Section property:	I=1000 in^4
Constraints:	Left Node – constrain Ux and Uy, Rotational Spring constant about Z-axis kr = 10 000 lbf-in/rad
Load Case:	Nodal load -10 lbf

Results

-10.00 lbf

max: -0.100
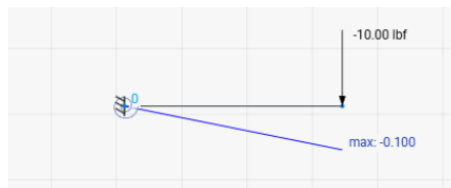
Units:			in		
Element	x/L	Ux	Uy	Ur	
1	0	0	0	0	-0.01
1	1	0	-0.1		-0.01

Comparison of Results

Node	Deformations, mm		
	Theoretical	RodX	Midas/Civil
Δx(2)	0.00	0.00	0.00
Δx(2)	-0.10	-0.10	-0.10
θz(2)	-0.01	-0.01	-0.01

Reference

1. Midas verification examples, Midas/Civil Ltd., 2022, example – Static-8