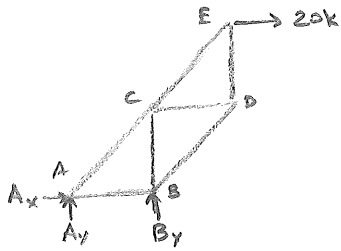
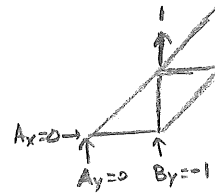


Homework 6: Problem 1

Real



Virtual for Δ_{cy}



a)

Member	axial force (real) N (k)	axial n (k)	L (ft)	A (in ²)	E (ksi)
AB	-20	0	16	3	29000
AC	56.57	0	$16\sqrt{2}$	3	↓
BC	-20	1	16	3	
BD	-28.28	0	$16\sqrt{2}$	5	
CD	20	0	16	5	
CE	28.28	0	$16\sqrt{2}$	5	
DE	-20	0	16	5	

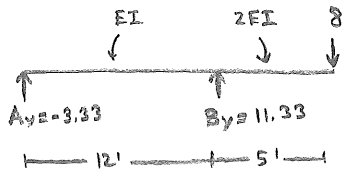
$$(1k) \Delta_{cy} = \sum \frac{NnL}{EA} = \frac{(-20)(1)(16)}{(29000)(3)} \times 2 = -0.044 \text{ k}\cdot\text{in} \Rightarrow \boxed{\Delta_{cy} = 0.044 \text{ in. } \downarrow}$$

b) Special case

$$(20k) \Delta_{EX} = \sum \frac{N^2 L}{EA} = 15.8 \text{ k}\cdot\text{in} \Rightarrow \boxed{\Delta_{EX} = 0.79 \text{ in. } \rightarrow}$$

Homework 6: Problem 2

Real

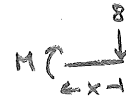


A → B $0 \leq x \leq 12$



$$M = -3.33x$$

C → B $0 \leq x \leq 5$



$$M = -8x$$

a) Θ_A

Virtual



A → B



$$m = -1 + \frac{1}{12}x$$

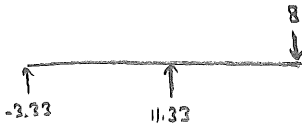
C → B



$$m = 0$$

$$(1 \text{ k}\cdot\text{ft}) \Theta_A = \left[\int_0^{12} \frac{(-3.33x)(-1 + \frac{1}{12}x)}{(29000)(100)} dx + \int_0^5 \frac{(-8x)(0)}{2(29000)(100)} dx \right] \times 12^2 = 3.97 \times 10^{-3} \text{ k}\cdot\text{ft}\cdot\text{rad} \Rightarrow \Theta_A = 3.97 \times 10^{-3} \text{ rad } \downarrow$$

b) Δ_C Virtual (set as 8 to match real)



$$(8 \text{ k}) \Delta_C = \left[\int_0^{12} \frac{(-3.33x)^2}{(29000)(100)} dx + \int_0^5 \frac{(-8x)^2}{(29000)(100) \times 2} dx \right] \times 12^3 = 4.608 \text{ k}\cdot\text{in.} \Rightarrow \Delta_C = 0.576 \text{ in. } \downarrow$$