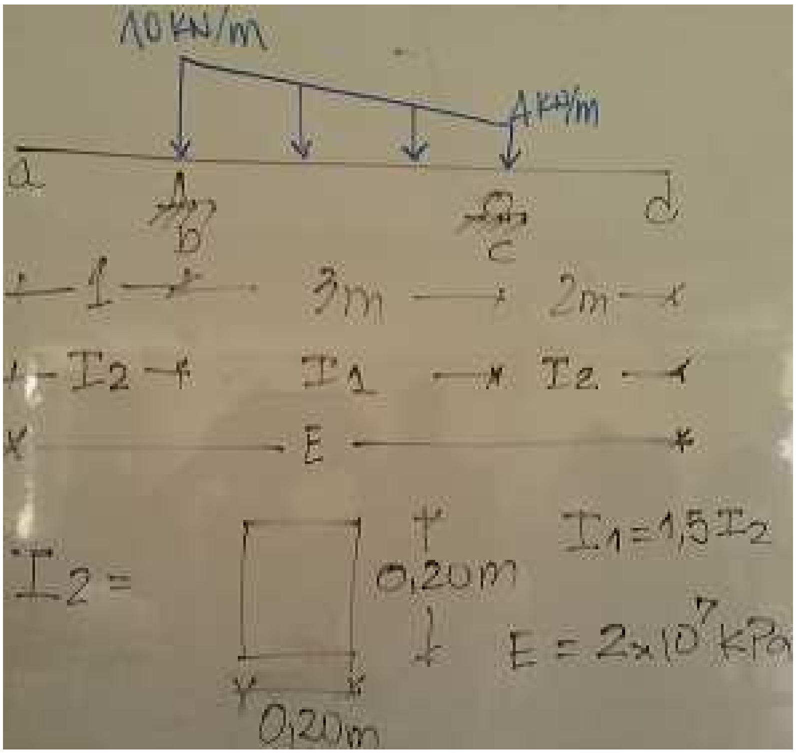

Usando el método del Área del Diagrama de Momento Flector, encontrar ángulos entre las tangentes y distancias entre tangentes y la curva elástica

#1: [CaseMode := Sensitive, InputMode := Word]

#2: $\left[\text{Datos del ejercicio:},\ I2 := \frac{1}{12}\cdot 0.2^{4},\ I1 := 0.5\cdot I2,\ E := 2\cdot 10^{7}\right]$

#3: [Cálculo de reacciones:, Rb :=, Rc :=]

#4:
$$\left[\begin{array}{c} Rb + Rc = \frac{10 + 4}{2}\cdot 3 \\ Rb\cdot 1 + Rc\cdot(1 + 3) = 4\cdot 3\cdot\left(1 + \frac{3}{2}\right) + \frac{(10 - 4)\cdot 3}{2}\cdot\left(1 + \frac{1}{3}\cdot 3\right) \end{array}\right]$$

#5: $[Rb := 12,\ Rc := 9]$

#6: [Momentos flectores:, Mf1(x) :=, Mf2(x) :=, Mf3(x)]

#7:
$$\left[\begin{array}{c} Mf1(x) := 0 \\ Mf2(x) := Rb\cdot(x - 1) - (12 - 2\cdot x)\cdot(x - 1)\cdot\frac{x - 1}{2} - (10 - (12 - 2\cdot x))\cdot\frac{x - 1}{2}\cdot\frac{2}{3}\cdot(x - 1) \\ Mf3(x) := Rb\cdot(x - 1) + Rc\cdot(x - 4) - 4\cdot 3\cdot\left(x - 1 - \frac{3}{2}\right) - \frac{(10 - 4)\cdot 3}{2}\cdot\left(x - 1 - \frac{1}{3}\cdot 3\right) \end{array}\right]$$

#8:
$$\left[\begin{array}{c} Mf1(x) := 0 \\ Mf2(x) := 0.3333333333\cdot(x - 1)\cdot(x^{2} - 17\cdot x + 52) \\ Mf3(x) := 0 \end{array}\right]$$

#9: [Ángulos entre tangentes medidos en radianes:, θab :=, θac :=, θad :=, θba :=, θbc :=, θbd :=, θcd :=]

#10:
$$\left[\begin{array}{c} \theta ab := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\ dx\right) \\ \theta ac := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\ dx + \frac{1}{I1}\cdot\int_1^4 Mf2(x)\ dx\right) \\ \theta ad := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\ dx + \frac{1}{I1}\cdot\int_1^4 Mf2(x)\ dx + \frac{1}{I2}\cdot\int_4^6 Mf3(x)\ dx\right) \end{array}\right]$$

#11:
$$\left[\begin{array}{c} \theta ab := 0 \\ \theta ac := 0.0118125 \\ \theta ad := 0.0118125 \end{array}\right]$$

#12:
$$\left[\begin{array}{c} \theta ba := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_1^0 Mf1(x)\ dx\right) \\ \theta bc := \frac{1}{E}\cdot\left(\frac{1}{I1}\cdot\int_1^4 Mf2(x)\ dx\right) \\ \theta bd := \frac{1}{E}\cdot\left(\frac{1}{I1}\cdot\int_1^4 Mf2(x)\ dx + \frac{1}{I2}\cdot\int_4^6 Mf3(x)\ dx\right) \end{array}\right]$$

#13:
$$\left[\begin{array}{c} \theta ba := 0 \\ \theta bc := 0.0118125 \\ \theta bd := 0.0118125 \end{array}\right]$$

#14:
$$\left[\theta cd := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_4^6 Mf3(x)\ dx\right)\right]$$

#15:
$$[\theta cd := 0]$$

#16: [Distancias entre tangentes y puntos de la viga deformada (elástica) en metros:, δab :=, δac :=, δad :=, δbc :=, δbd :=, δcd :=]

#17:
$$\left[\begin{array}{c} \delta ab := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\cdot(1 - x)\ dx\right) \\ \delta ac := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\cdot(4 - x)\ dx + \frac{1}{I1}\cdot\int_1^4 Mf2(x)\cdot(4 - x)\ dx\right) \\ \delta ad := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_0^1 Mf1(x)\cdot(6 - x)\ dx + \frac{1}{I1}\cdot\int_1^4 Mf2(x)\cdot(6 - x)\ dx + \frac{1}{I2}\cdot\int_4^6 Mf3(x)\cdot(6 - x)\ dx\right) \end{array}\right]$$

#18:
$$\left[\begin{array}{c} \delta ab := 0 \\ \delta ac := 0.018225 \\ \delta ad := 0.04185 \end{array}\right]$$

#19:
$$\left[\begin{array}{c} \delta ba := \dfrac{1}{E}\cdot\left(\dfrac{1}{I2}\cdot\int_1^0 Mf1(x)\cdot(0-x)\,dx\right) \\ \delta bc := \dfrac{1}{E}\cdot\left(\dfrac{1}{I1}\cdot\int_1^4 Mf2(x)\cdot(4-x)\,dx\right) \\ \delta bd := \dfrac{1}{E}\cdot\left(\dfrac{1}{I1}\cdot\int_1^4 Mf2(x)\cdot(6-x)\,dx + \dfrac{1}{I2}\cdot\int_4^6 Mf3(x)\cdot(6-x)\,dx\right) \end{array}\right]$$

#20:
$$\left[\begin{array}{c} \delta ba := 0 \\ \delta bc := 0.018225 \\ \delta bd := 0.04185 \end{array}\right]$$

#21:
$$\left[\delta cd := \frac{1}{E}\cdot\left(\frac{1}{I2}\cdot\int_4^6 Mf3(x)\cdot(6-x)\,dx\right)\right]$$

#22: $[\delta cd := 0]$

#23: [Giros en radianes:, θa :=, θb :=, θc :=, θd :=]

#24:
$$\left[\begin{array}{c} \theta b := -\dfrac{\delta bc}{3} \\ \theta a := -\theta ab + \theta b \\ \theta c := \theta bc + \theta b \\ \theta d := \theta cd + \theta c \end{array}\right]$$

#25:
$$\left[\begin{array}{c} \theta b := -0.006075 \\ \theta a := -0.006075 \\ \theta c := 0.0057375 \\ \theta d := 0.0057375 \end{array}\right]$$

#26: [Flechas en metros:, Δa :=, Δd :=]

#27:
$$\left[\begin{array}{c} \Delta a := \delta ba + \theta b\cdot(0-1) \\ \Delta d := \delta cd + \theta c\cdot(6-4) \end{array}\right]$$

#28:
$$\left[\begin{array}{c} \Delta a := 0.006075 \\ \Delta d := 0.011475 \end{array}\right]$$

#29: [Distancias entre la tangente en b y un punto ψ (=x) de la elástica:, δψ1(ψ) :=, δψ2(ψ) :=, δψ3(ψ) :=]

#30:
$$\left[\begin{array}{c} \delta b\psi 1(\psi) := \dfrac{1}{E}\cdot\left(\dfrac{1}{I2}\cdot\int_1^\psi Mf1(x)\cdot(\psi-x)\,dx\right) \\ \delta b\psi 2(\psi) := \dfrac{1}{E}\cdot\left(\dfrac{1}{I1}\cdot\int_1^\psi Mf2(x)\cdot(\psi-x)\,dx\right) \\ \delta b\psi 3(\psi) := \dfrac{1}{E}\cdot\left(\dfrac{1}{I1}\cdot\int_1^4 Mf2(x)\cdot(\psi-x)\,dx + \dfrac{1}{I2}\cdot\int_4^\psi Mf3(x)\cdot(\psi-x)\,dx\right) \end{array}\right]$$

#31: $$\begin{bmatrix} \delta b\psi1(\psi) := 0 \\ \delta b\psi2(\psi) := 1.25\cdot10^{-5}\cdot(\psi^{5} - 30\cdot\psi^{4} + 230\cdot\psi^{3} - 520\cdot\psi^{2} + 465\cdot\psi - 146) \\ \delta b\psi3(\psi) := 0.0003375\cdot(35\cdot\psi - 86) \end{bmatrix}$$

#32: [Flechas en metros en un punto ψ(=x):, Δ1(ψ) :=, Δ2(ψ) :=, Δ3(ψ) :=]

#33: $$\begin{bmatrix} \Delta1(\psi) := \delta b\psi1(\psi) + \theta b\cdot(\psi - 1) \\ \Delta2(\psi) := \delta b\psi2(\psi) + \theta b\cdot(\psi - 1) \\ \Delta3(\psi) := \delta b\psi3(\psi) + \theta b\cdot(\psi - 1) \end{bmatrix}$$

#34: $$\begin{bmatrix} \Delta1(\psi) := 0.006075\cdot(1 - \psi) \\ \Delta2(\psi) := 1.25\cdot10^{-5}\cdot(\psi^{5} - 30\cdot\psi^{4} + 230\cdot\psi^{3} - 520\cdot\psi^{2} - 21\cdot\psi + 340) \\ \Delta3(\psi) := 0.0057375\cdot(\psi - 4) \end{bmatrix}$$