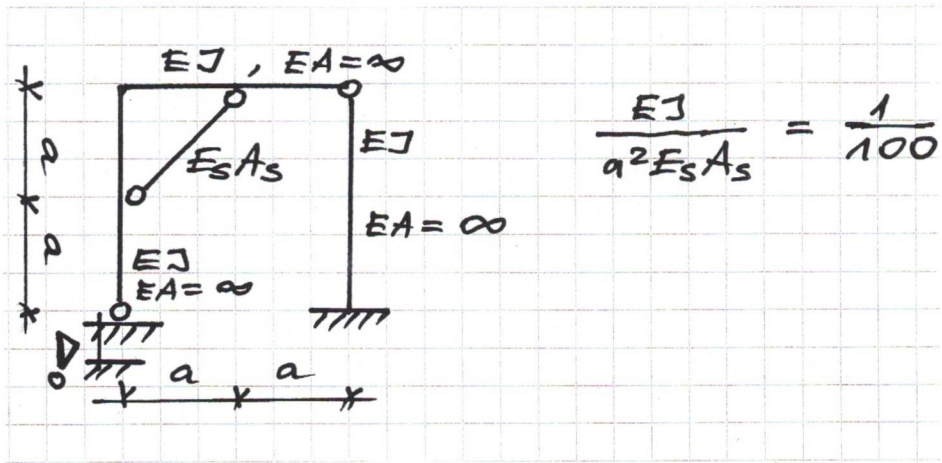


Imię i NAZWISKO				
Prowadzący ćwiczenia, nr grupy				
ocena zadania 1	ocena zadania 2	ocena zadania 3	ocena egz. pis.	Ocena ostateczna z egzaminu
				Ocena łączna

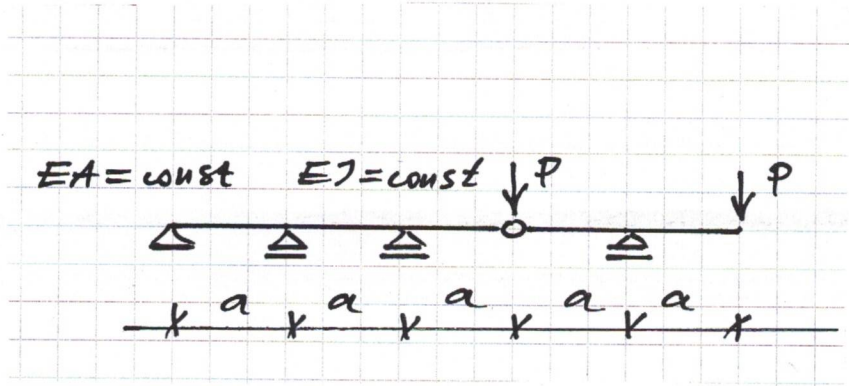
Zadanie 1

Dana jest rama płaska obciążona kinematycznie jak na rysunku. Sporządzić wykres momentów metodą sił. (Given is a planar frame loaded kinematically as shown in the figure. Construct the diagram of the bending moments by the Force Method)



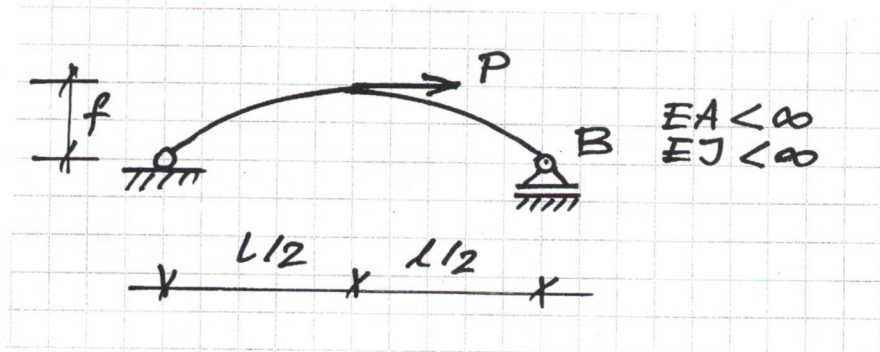
Zadanie 2

Dana jest belka obciążona jak na rysunku. Zapisać równania macierzowej metody przemieszczeń. (Given is a beam loaded as shown in the figure. Write down the equations of the displacement method in its matrix version.)



Zadanie 3

Dany jest łuk paraboliczny obciążony jak na rysunku. Znaleźć formułę na przemieszczenie poziome u_B. (Given is a parabolic arch loaded as shown in the figure. Derive the formula for the horizontal displacement u_B.)



$EA = \text{const.}$
 $EI_y = \text{const.}$

$u_B = ?$

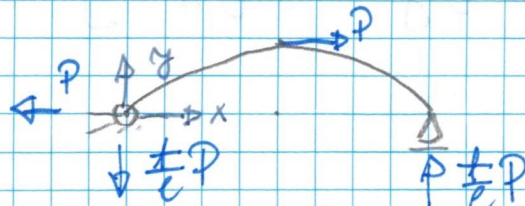
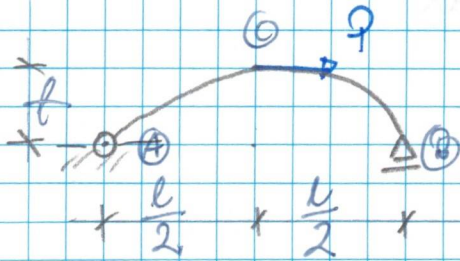
r-nie Tulu

$$y(x) = \frac{4f}{l^2} x(l-x)$$

$$\text{tg } \varphi(x) = \frac{dy}{dx} = \frac{4f}{l^2} (l-2x)$$

$$\sin \varphi = \frac{\text{tg } \varphi}{\sqrt{1 + \text{tg}^2 \varphi}}$$

$$\cos \varphi = \frac{1}{\sqrt{1 + \text{tg}^2 \varphi}}$$



odcinek A-C

$$\sum F_x^{\text{loh}} = 0$$

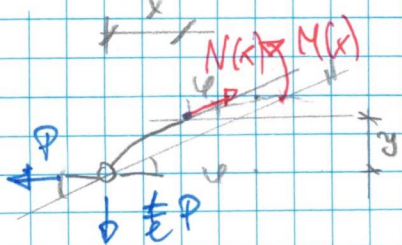
$$N_{A-C}(x) - P \cos \varphi - \frac{1}{2} P \sin \varphi = 0$$

$$N_{A-C}(x) = P \left(\cos \varphi + \frac{1}{2} \sin \varphi \right)$$

$$\sum M_x = 0$$

$$M_{A-C}(x) - P \cdot y + \frac{1}{2} \cdot x P = 0$$

$$M_{A-C}(x) = P \left(y - \frac{1}{2} x \right)$$



odcinek C-B

$$\sum F_x^{\text{loh}} = 0$$

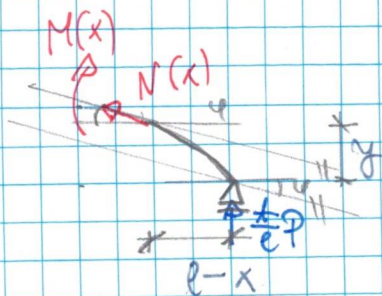
$$N_{C-B}(x) + \frac{1}{2} P \sin \varphi = 0$$

$$N_{C-B}(x) = -\frac{1}{2} P \sin \varphi$$

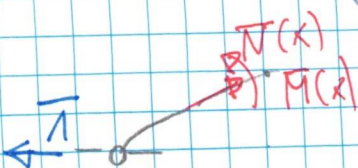
$$\sum M_x = 0$$

$$M_{C-B}(x) - \frac{1}{2} P \cdot (l-x) = 0$$

$$M_{C-B}(x) = P \left(l - \frac{x}{2} \right)$$



Stan wirtualny



$$\bar{N}(x) = \bar{T} \cos \varphi$$

$$\bar{M}(x) = \bar{T} \cdot y$$

