

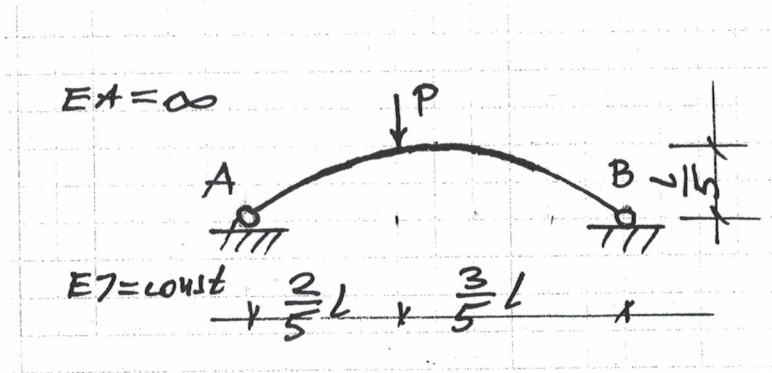
Egzamin pisemny z Mechaniki Konstrukcji I, 10 lutego 2025 r.

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|--------------------------------|-----------------|-----------------|-----------------|------------------|
| Imię i NAZWISKO | | | | |
| Prowadzący ćwiczenia, nr grupy | | | | |
| ocena zadania 1 | ocena zadania 2 | ocena zadania 3 | ocena egz. pis. | Ocena Ostateczna |
| | | | | Data |

Zadanie 1

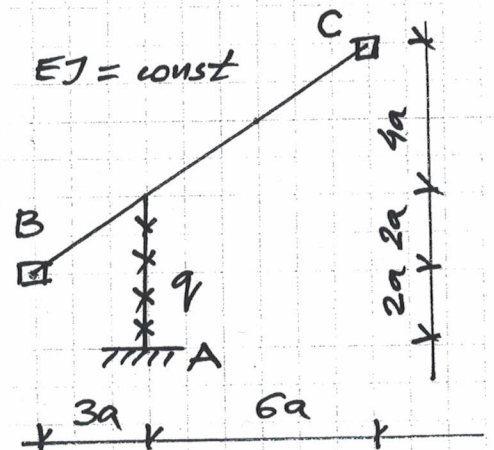
Dany jest łuk paraboliczny małowyniosły, podparty i obciążony jak na rysunku. Znaleźć

- reakcje poziome
 - moment zginający pod siłą skupioną.
- (Given is a shallow parabolic arch loaded as shown in the figure; compute
- the horizontal reactions,
 - the bending moment in the section where the point load is applied)



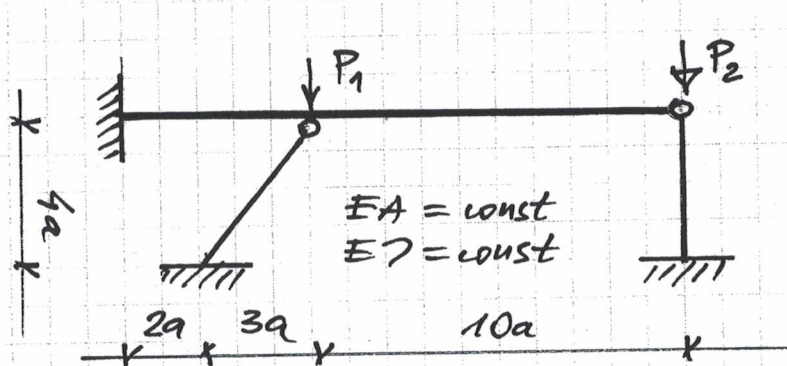
Zadanie 2

Dany jest ruszt przegubowy. Sporządzić wykres momentów zginających (Given is a system of beams. Construct the diagram of bending moments)



Zadanie 3

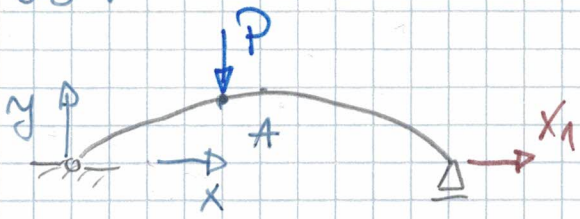
Dana jest rama z prętów wydłużalnych jak na rysunku. Zapisać równania macierzowej metody przemieszczeń. (Given is a frame of extensible bars, see the figure. Write down the equations of the stiffness matrix method)



ZADANIE 1 Egzamin MK1 10.11.2025

USW

r-nie zgodności

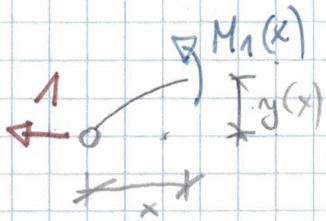


$$\delta_{11} X_1 + \delta_{10} = 0$$

r-nie łuku

$$y(x) = \frac{4f}{l^2} x(l-x) = \frac{4}{5} \frac{Pl}{l^2} (xl - x^2) = \frac{4}{5} x - \frac{4}{5} \frac{x^2}{l}$$

Stan $X_1 = 1$



$$M_1(x) = y(x)$$

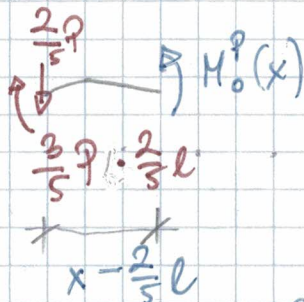
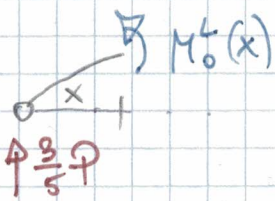
$$M_0^P(x) = \frac{6}{25} Pl - \frac{2}{5} P(x - \frac{2}{5}l)$$

Spr.

$$M_0^L(x) = \frac{3}{5} Px$$

$$M_0^P(l) = \frac{6}{25} Pl - \frac{2}{5} P \cdot \frac{3}{5} l = 0 \quad \text{ok.}$$

Stan "0"



$$\delta_{11} = \frac{1}{EI} \int_0^l M_1(x) M_1(x) dx = \frac{8}{375} \frac{l^3}{EI}$$

$$\delta_{10} = \frac{1}{EI} \left[\int_0^{\frac{2}{5}l} M_0^L(x) M_1(x) dx + \int_{\frac{2}{5}l}^l M_0^P(x) M_1(x) dx \right] = \frac{62}{3125} \frac{Pl^3}{EI}$$

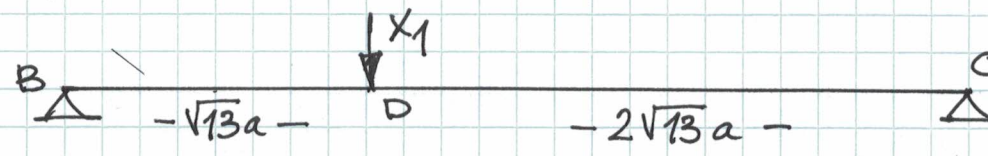
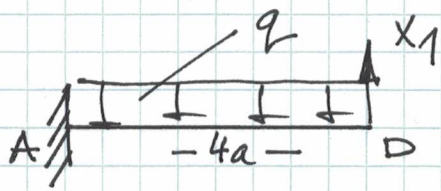
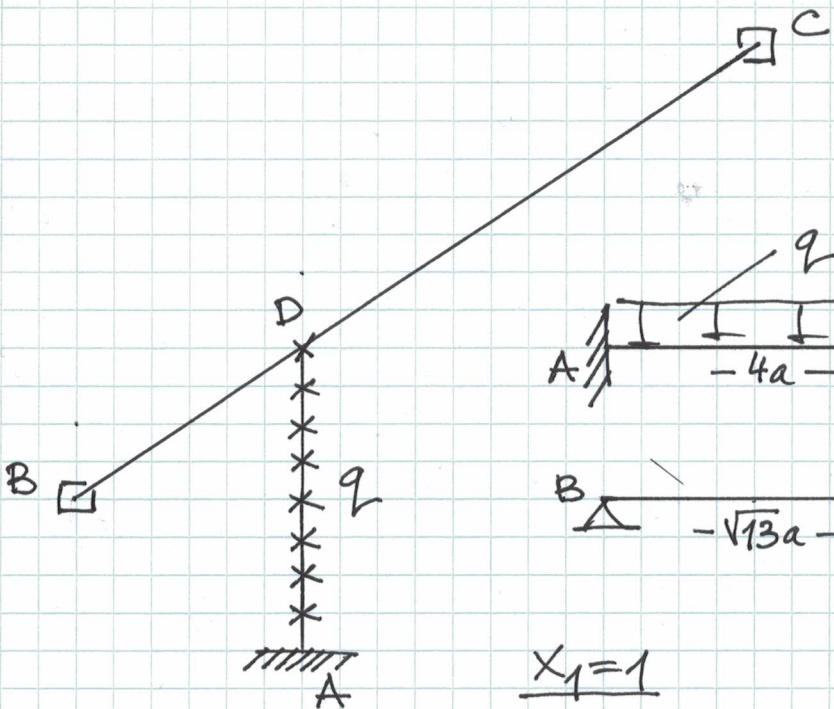
$$X_1 = -0,93 P$$

Odp. Reakcja pozioma $H_A = X_1 = -0,93 P$

$$M_A = X_1 M_1(\frac{2}{5}l) + M_0^L(\frac{2}{5}l) \approx 0,061 Pl$$

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zadanie 2

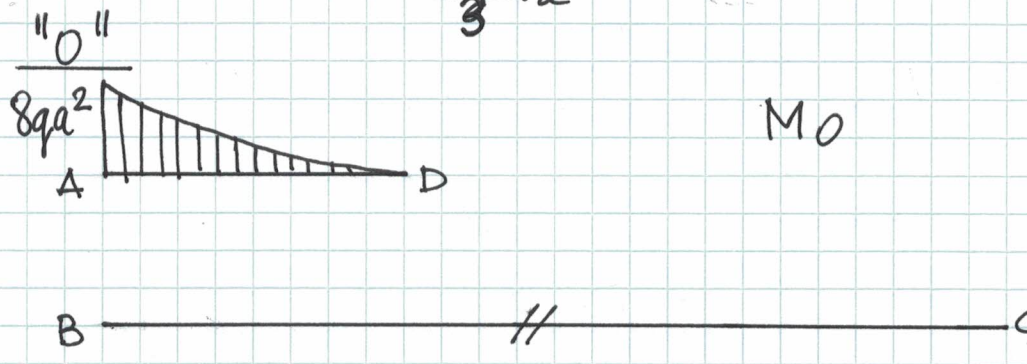
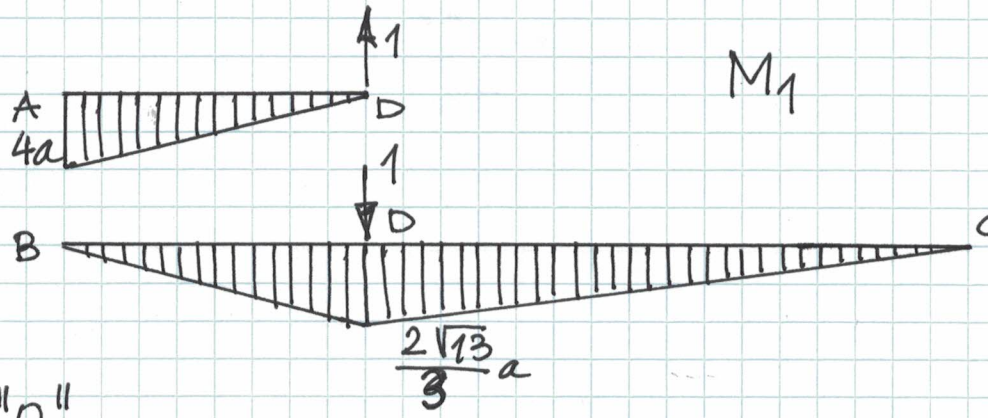


$X_1 = 1$

$$\delta_{11} = \frac{192 + 52\sqrt{13}}{9} \frac{a^3}{EJ}$$

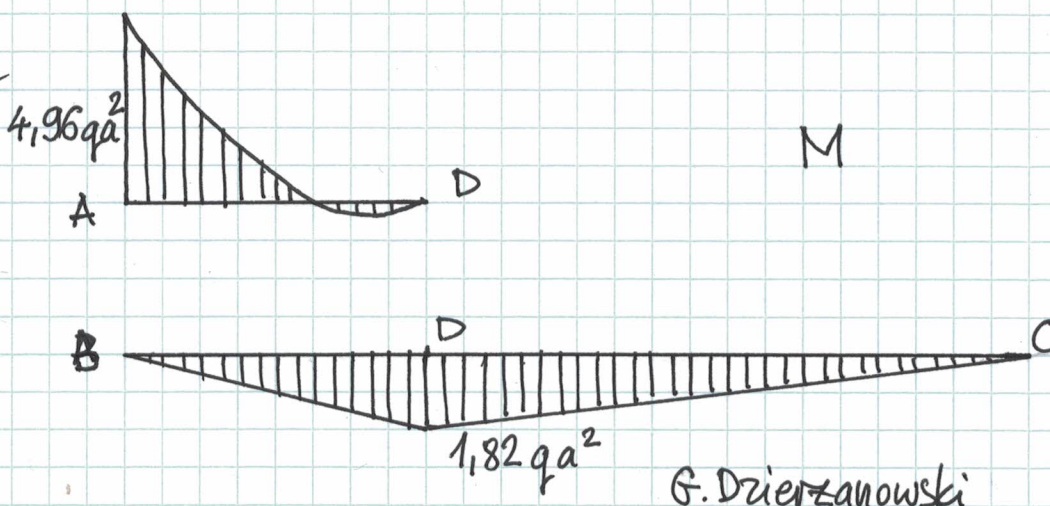
$$\approx 42,2 \frac{a^3}{EJ}$$

$$\delta_{10} = -32 \frac{qa^4}{EJ}$$



$$X_1 = \frac{72}{48 + 13\sqrt{13}} qa$$

$$\approx 0,76 qa$$



G. Dzierzanowski