Домашнее задание по курсу «Прикладная механика»

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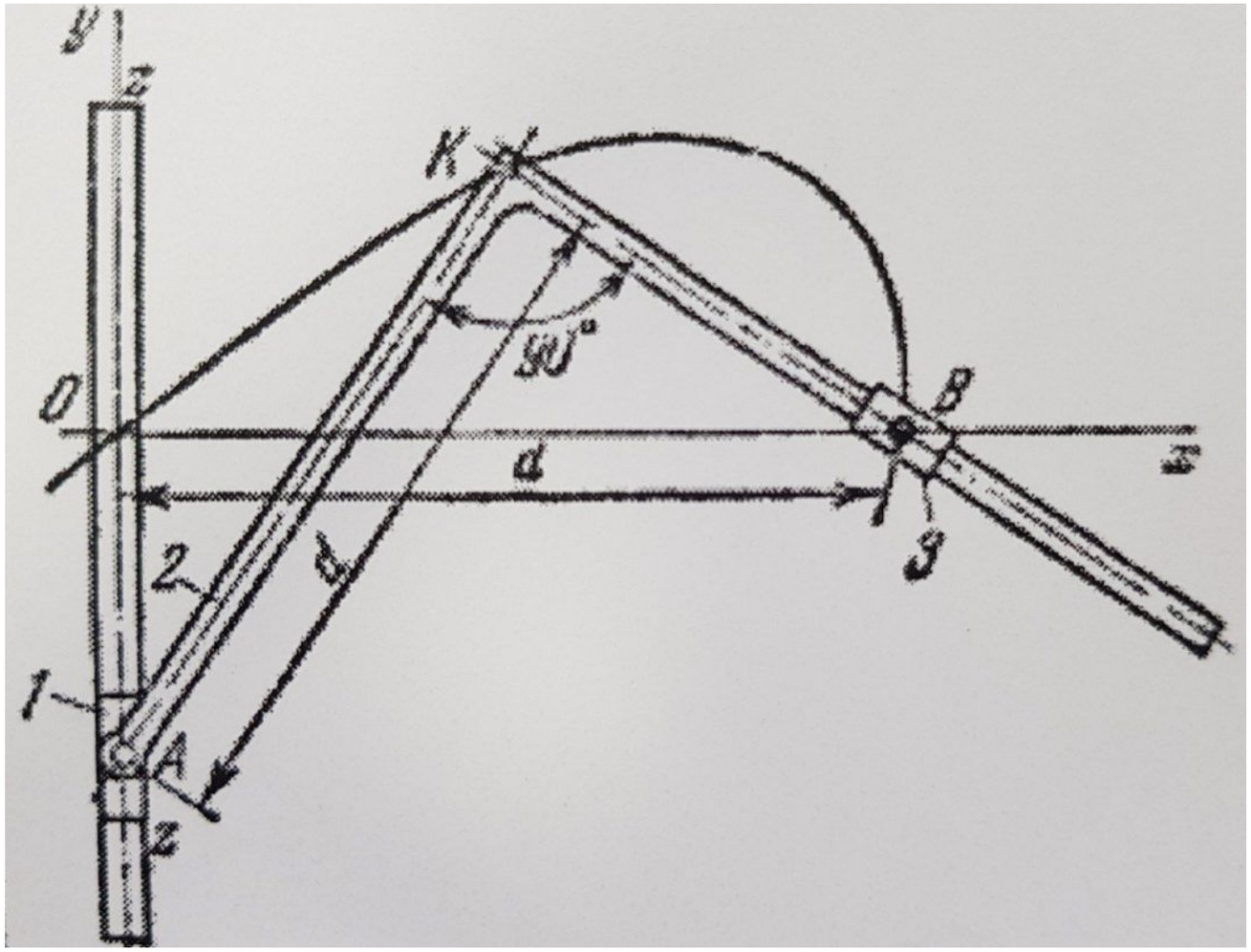
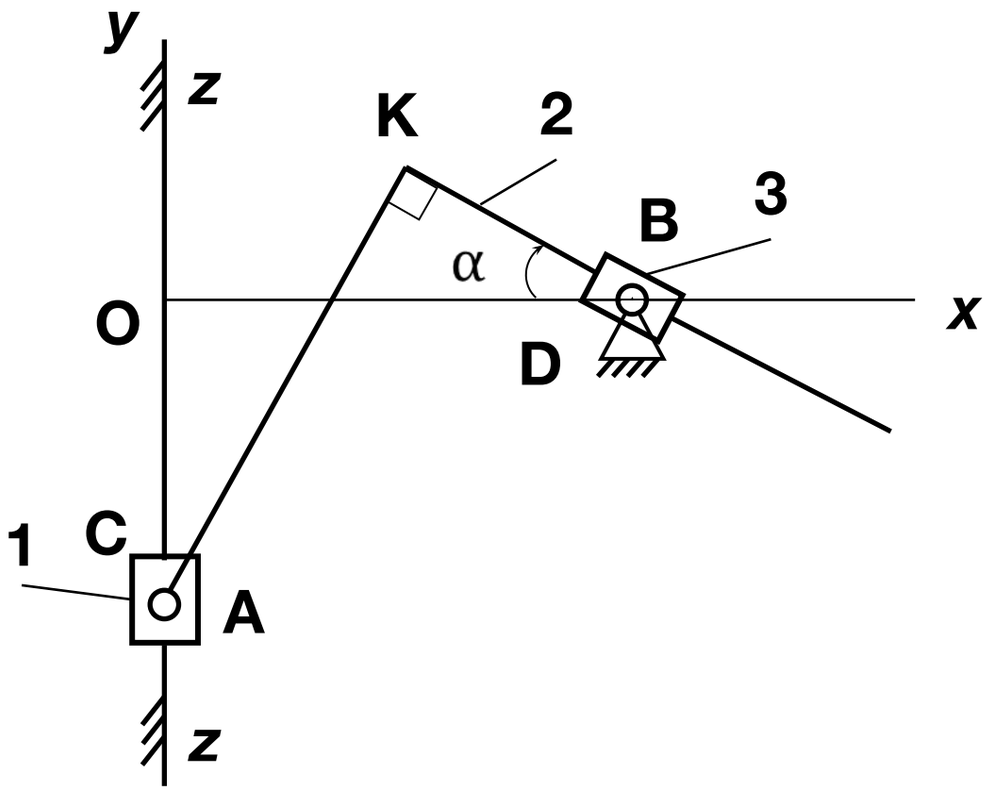
Колесников Н.

ЧЕТЫРЕХЗВЕННЫЙ КУЛИСНЫЙ МЕХАНИЗМ.



Структурный анализ механизма:



$W_{пл}$ = 3*n - 2*$p_н$ - $p_в$

$W_{пл}$ = 3*3 - 2*4 = 1

$W_{пр}$ = 6*n - 5*p_1 - 4*p_2 - 3*p_3 - 2*p_4 - p_5

$W_{пр}$ = 6*3 - 5*4 = -2

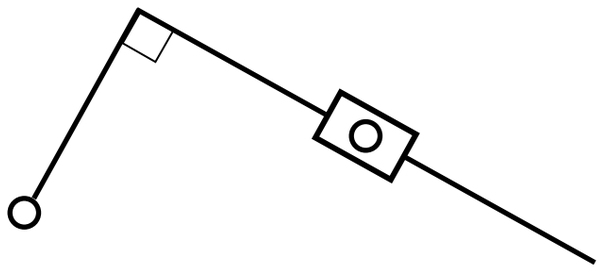
q = 3

q - количество избыточных связей

$W_{пр}$ и $W_{пл}$ - число степеней подвижности механизма в пространстве и на плоскости

Определение входного звена и групп Ассура

Группа Ассура 1: ВПВ



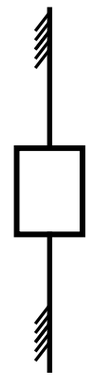
$W_{пл}$ = 3*n - 2*$p_н$ – $p_в$=6-3*2=0

$W_{пр}$= 6*n - 5*p_1 - 4*p_2 - 3*p_3 - 2*p_4 - p_5

$W_{пр}$ = 6*2 - 5*3 = -3

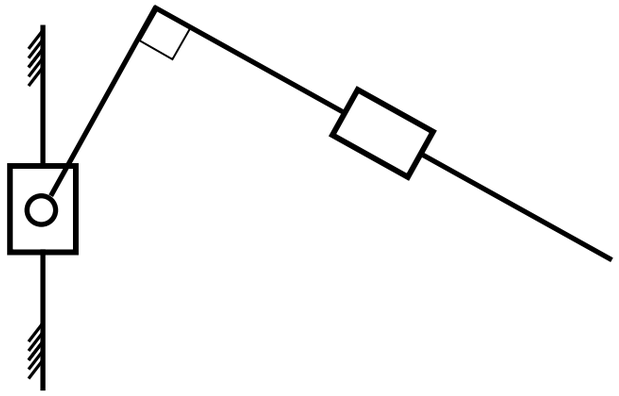
q = 3

Первичный механизм 1: стойка с ползуном



$W_{пл}$=3*n - 2*$p_н$– $p_в$=3-2=1

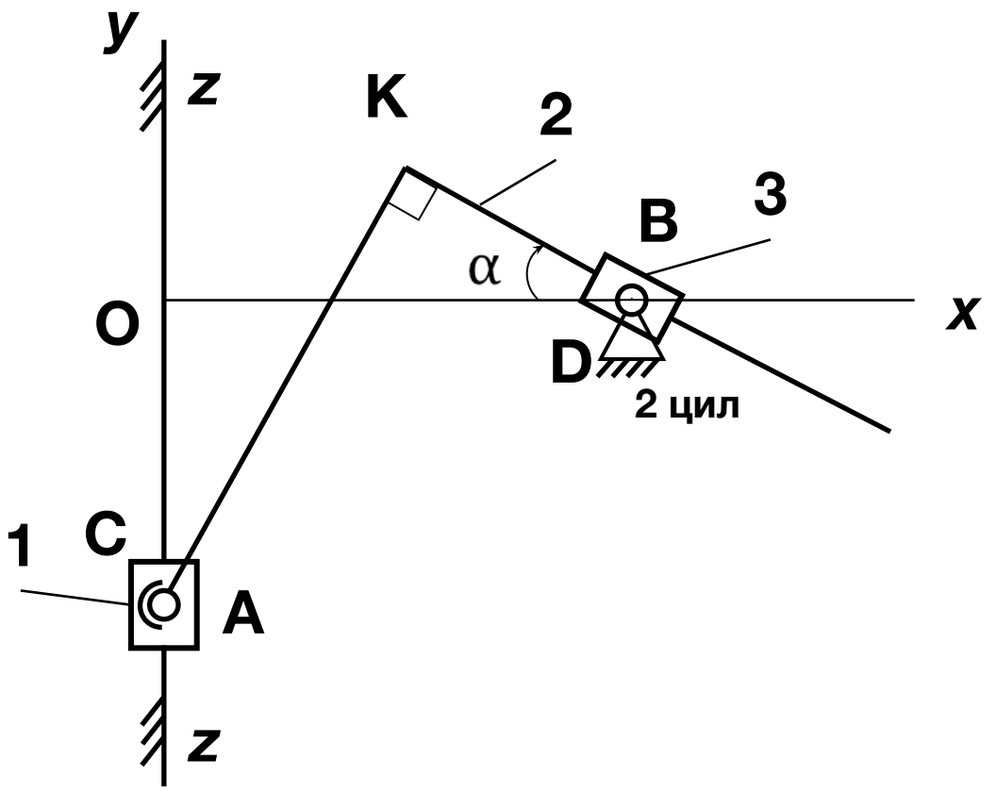
Группа Ассура 2: ПВП



Первичный механизм 2: стойка с кулисным камнем

Эквивалентная схема

Пара А меняется на сферическую, пара В меняется на цилиндрическую

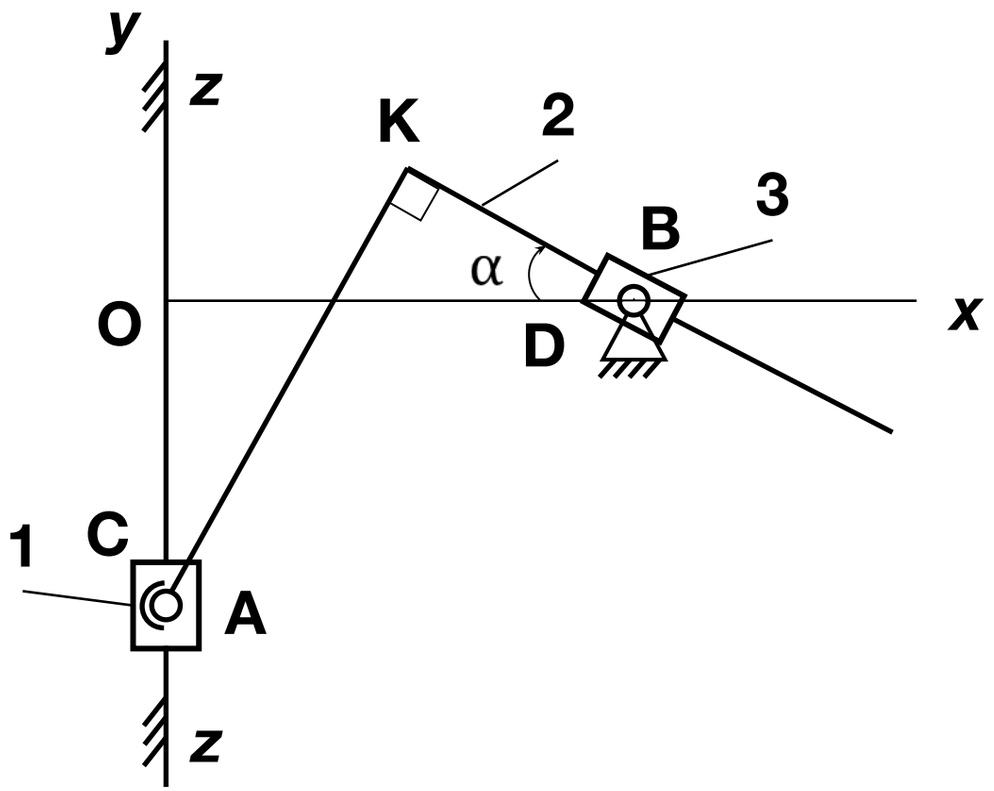


$W_{пл} = 3*3 - 2*4 = 1$

$W_{пр} = 6*3 - 5*2 - 4 - 3 = 1$

$q = W_{пл} - W_{пр} = 1 - 1 = 0$

Рассмотрим 6 положений механизма.
Для каждого положения построим план скоростей



1. $\alpha = 0$

2. $\alpha = \frac{\pi}{12}$

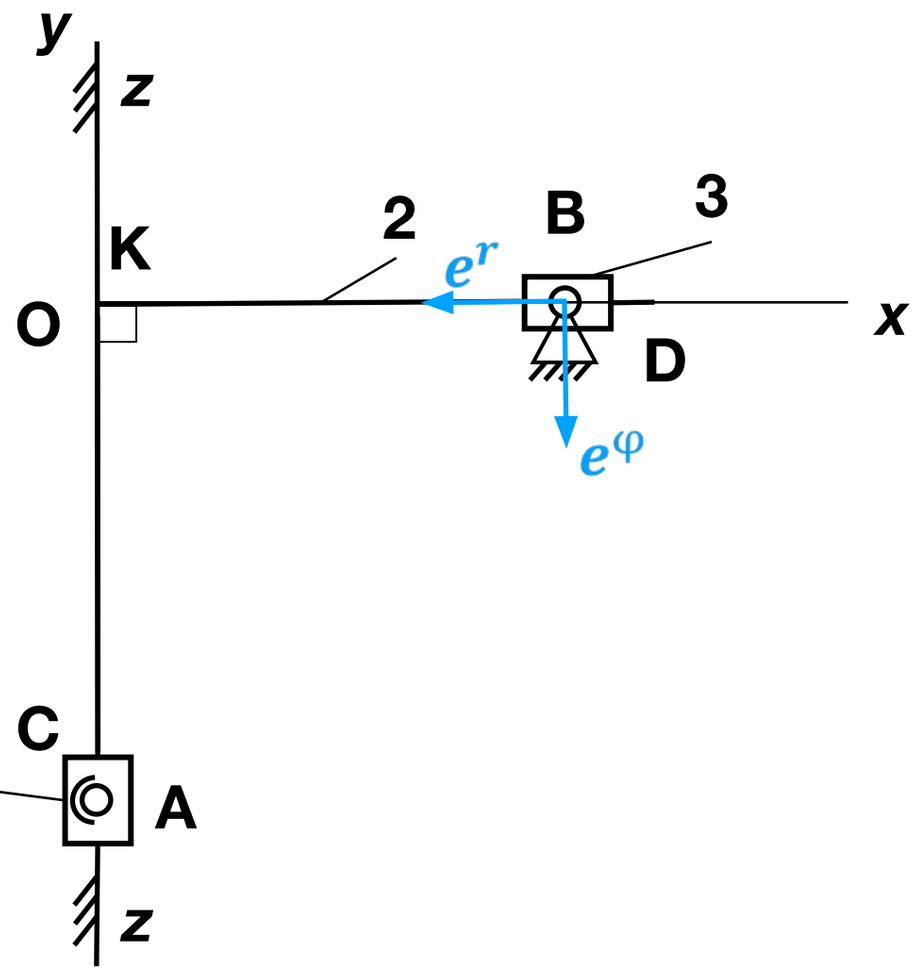
3. $\alpha = \frac{\pi}{6}$

4. $\alpha = \frac{\pi}{4}$

5. $\alpha = \frac{\pi}{3}$

6. $\alpha = \frac{5\pi}{12}$

1. $\alpha = 0$



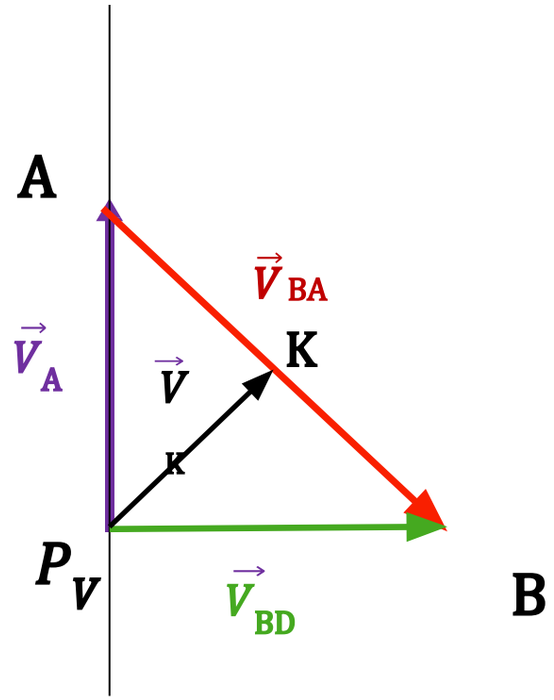
$V_{BA} \parallel {}_{KB}$

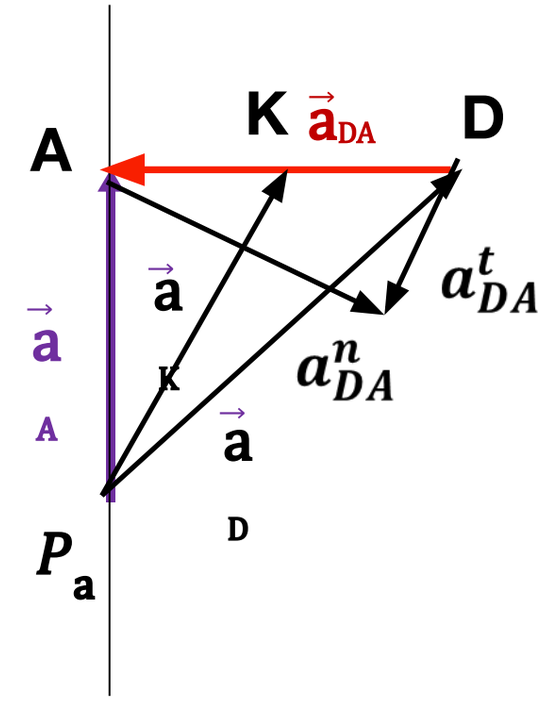
$V_A \uparrow\downarrow F,\ V_A \uparrow\downarrow$

Oy

$V_{BD} \perp AB$

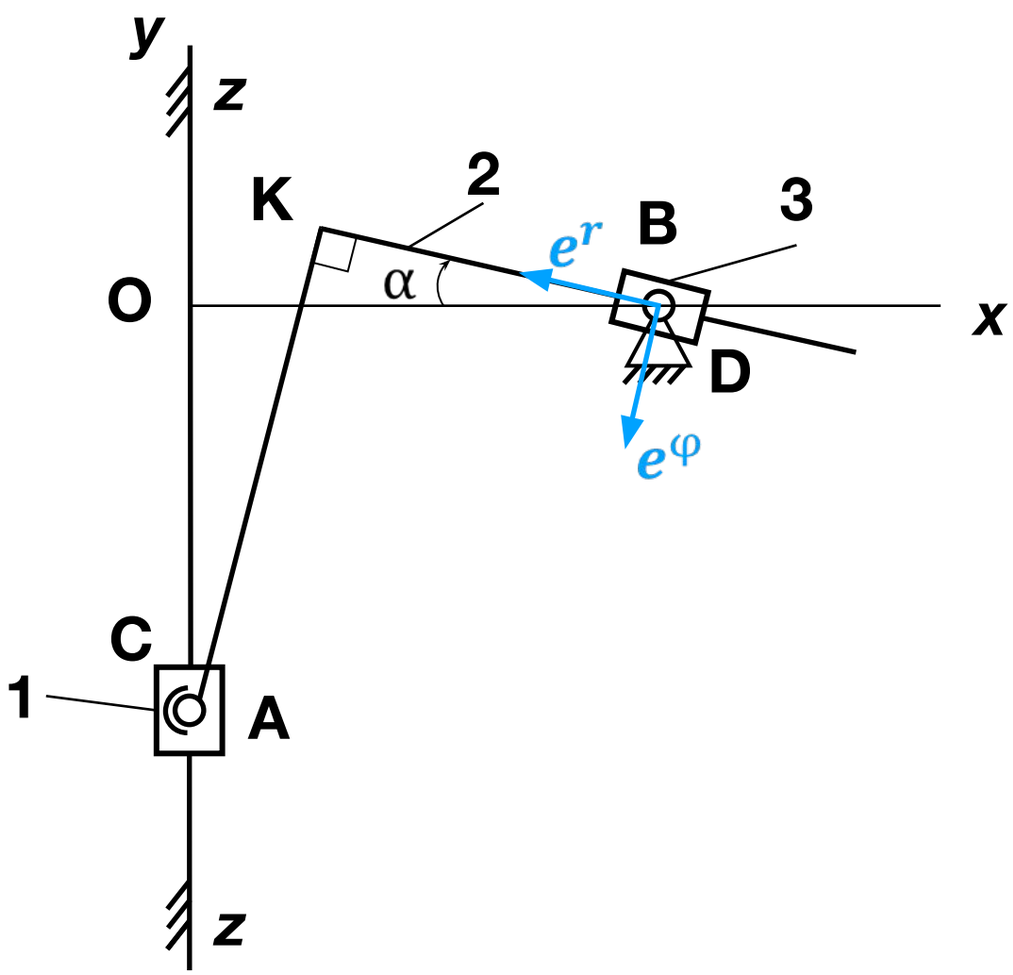
$$\begin{cases} V_B = V_A + V_{BA} \\ V_B = V_D + V_{BD} \end{cases}$$





$$a_D = a_A + a^n_{DA} + a^t_{DA}$$

2. $\alpha = \frac{\pi}{12}$

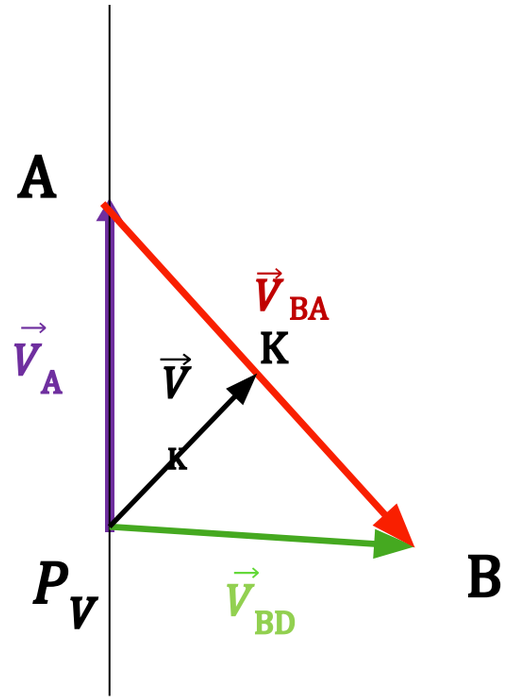


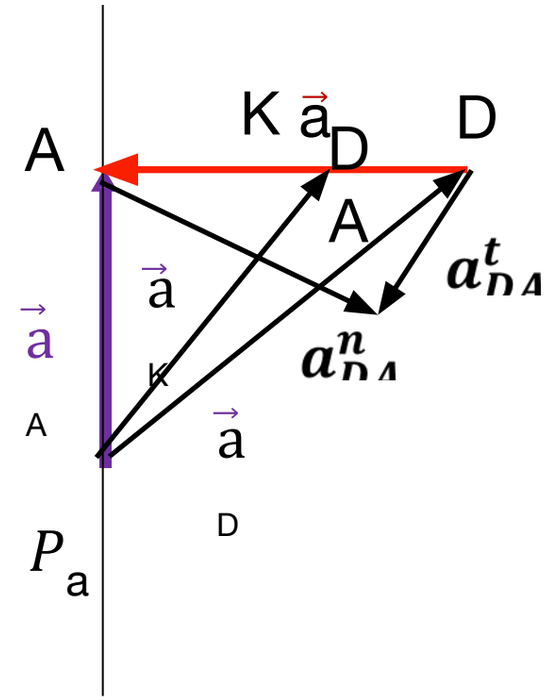
$V_{BA} \parallel KB$

$V_A \uparrow\downarrow F,\ V_A \uparrow\downarrow Oy$

$V_{BD} \perp AB$

$$\begin{cases} V_B = V_A + V_{BA} \\ V_B = V_D + V_{BD} \end{cases}$$

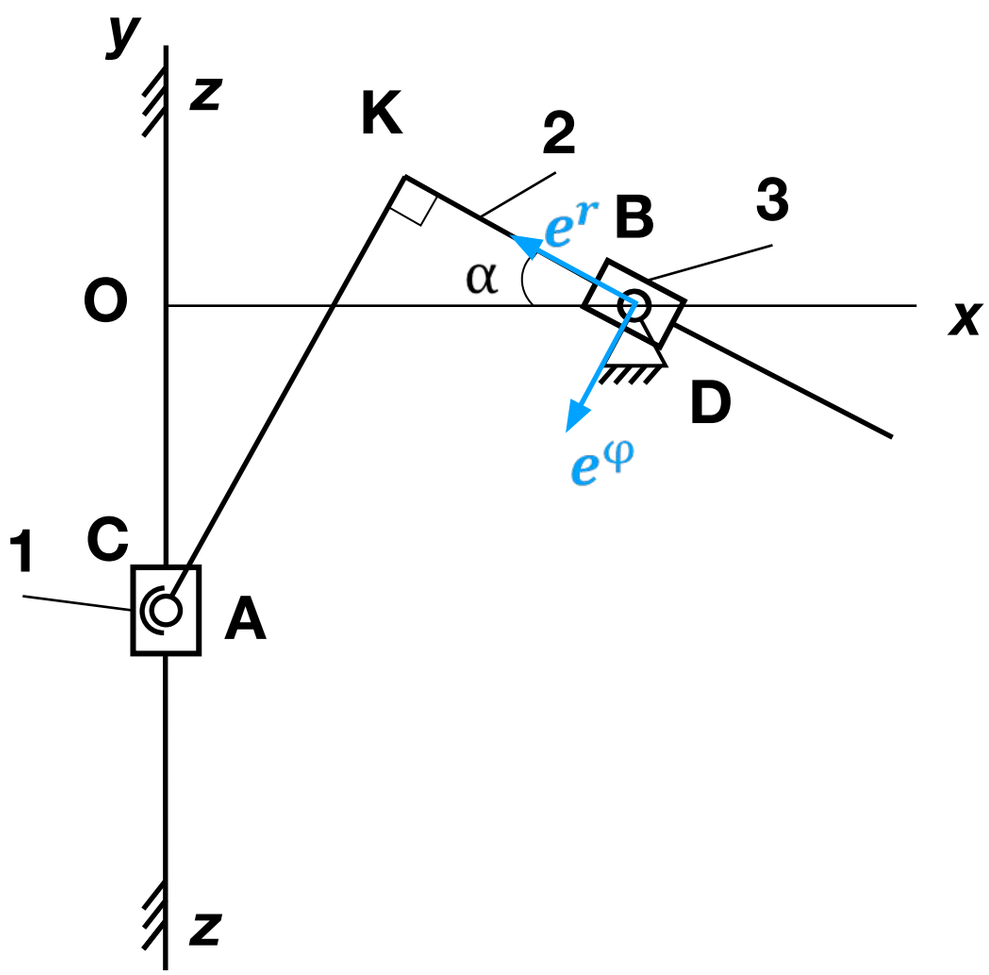




$a_B^n = w_1^2 * l_{AB}$

$a_B^t = e_1 * l_{AB}$

3. $\alpha = \frac{\pi}{6}$

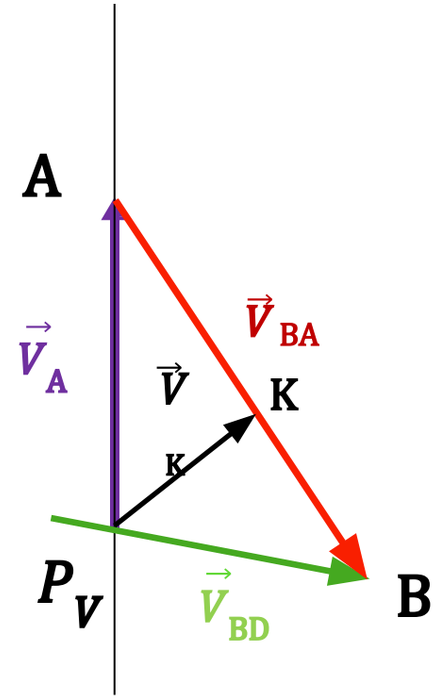


$V_{BA} \parallel KB$

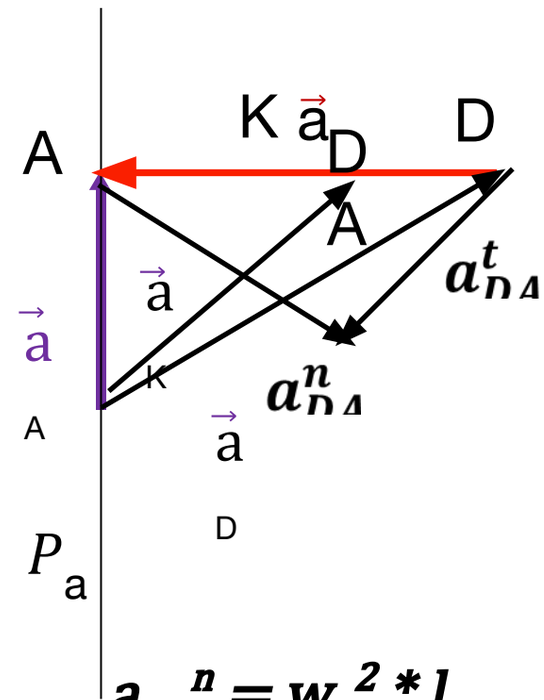
$V_A \uparrow\downarrow F,\ V_A \uparrow\downarrow Oy$

$V_{BD} \perp AB$

$$\begin{cases} V_B = V_A + V_{BA} \\ V_B = V_D + V_{BD} \end{cases}$$



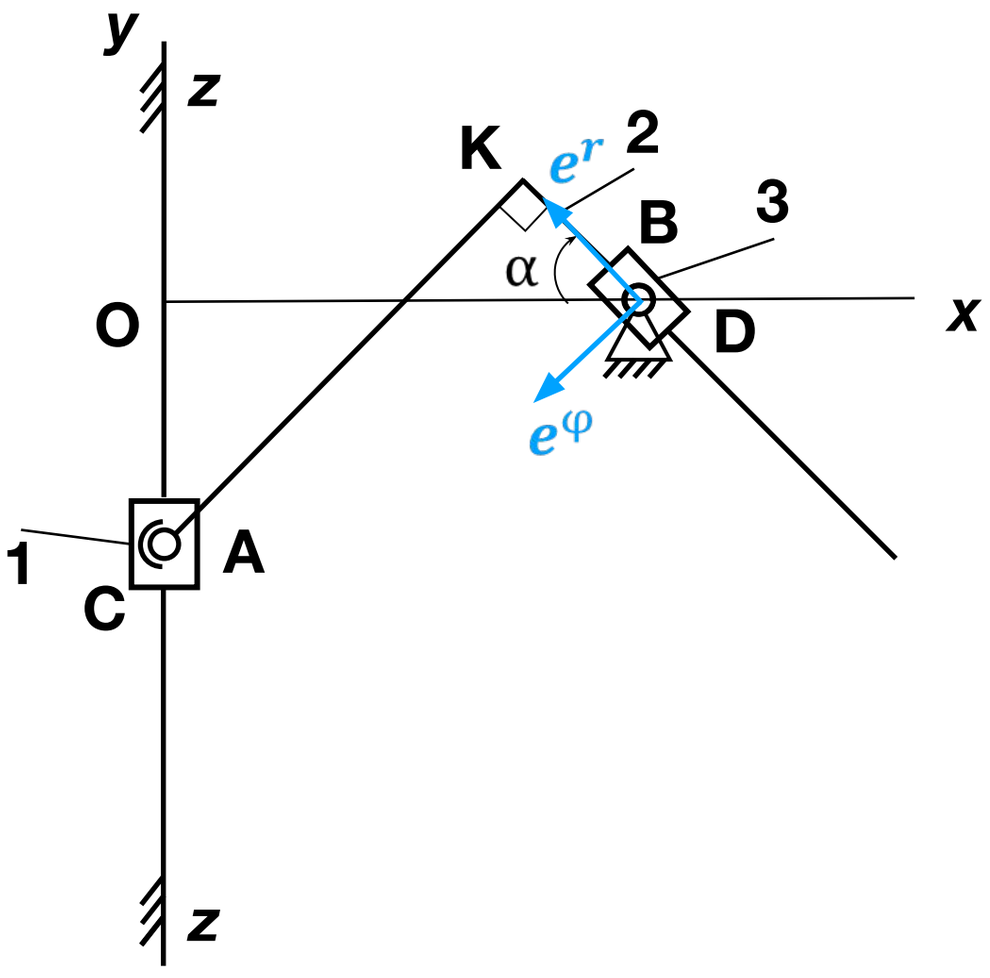
$$\bar{a}_B = \underset{//AB}{\bar{a}_B^{\,n}} + \underset{\perp AB}{\bar{a}_B^{\,t}}$$

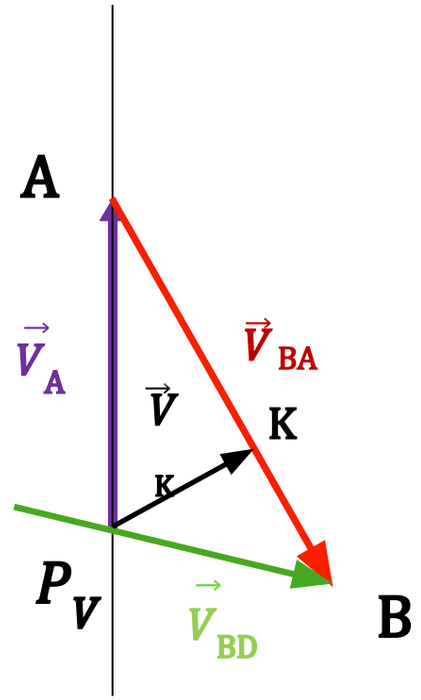


$a_B^{\,n} = w_1^{\,2} * l_{AB}$

$a_B^{\,t} = e_1 * l_{AB}$

4. $\alpha = \frac{\pi}{4}$





$V_{BA} \parallel {}_{KB}$

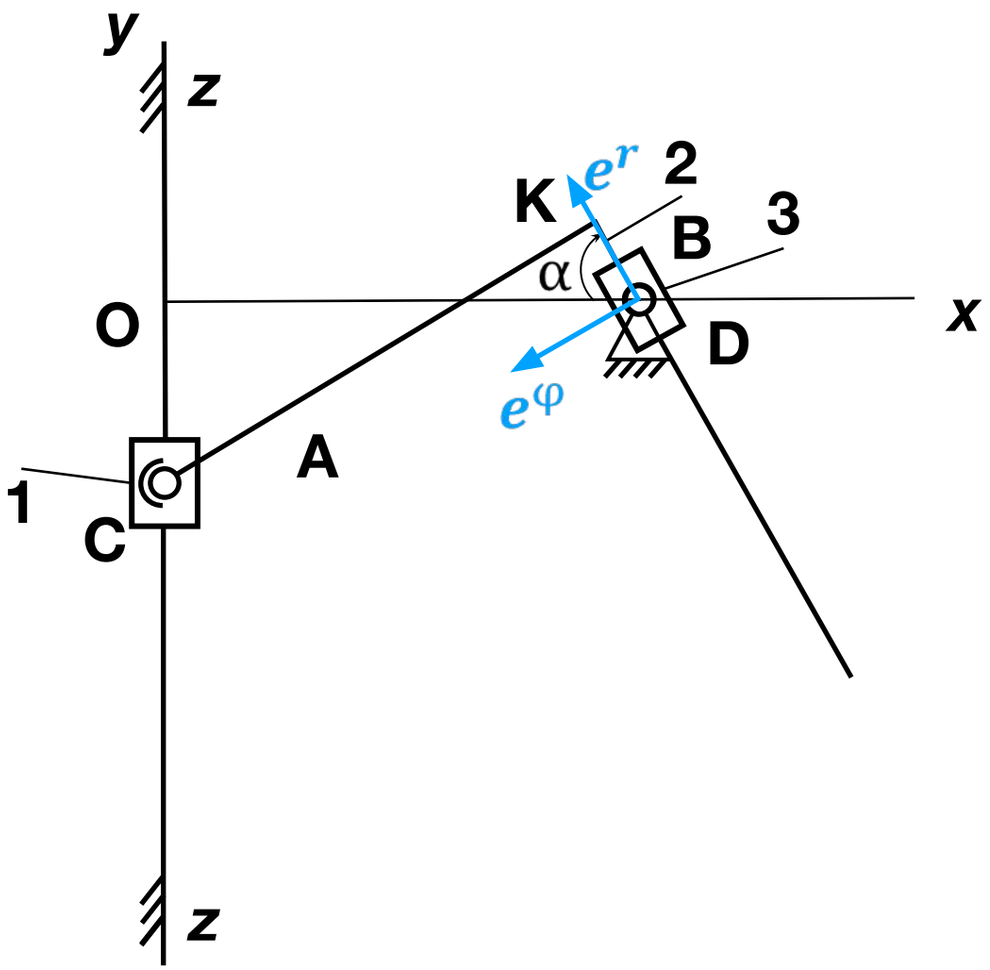
$V_A \uparrow\downarrow F,\ v_A \uparrow\downarrow$

Oy

$V_{BD} \perp AB$

$$\begin{cases} V_B = V_A + V_{BA} \\ V_B = V_D + V_{BD} \end{cases}$$

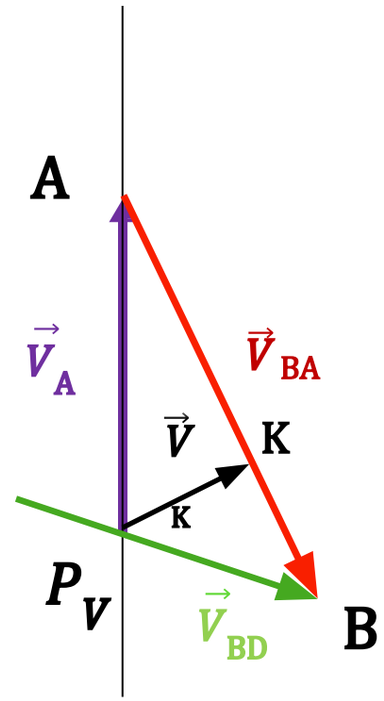
5. $\alpha = \frac{\pi}{3}$



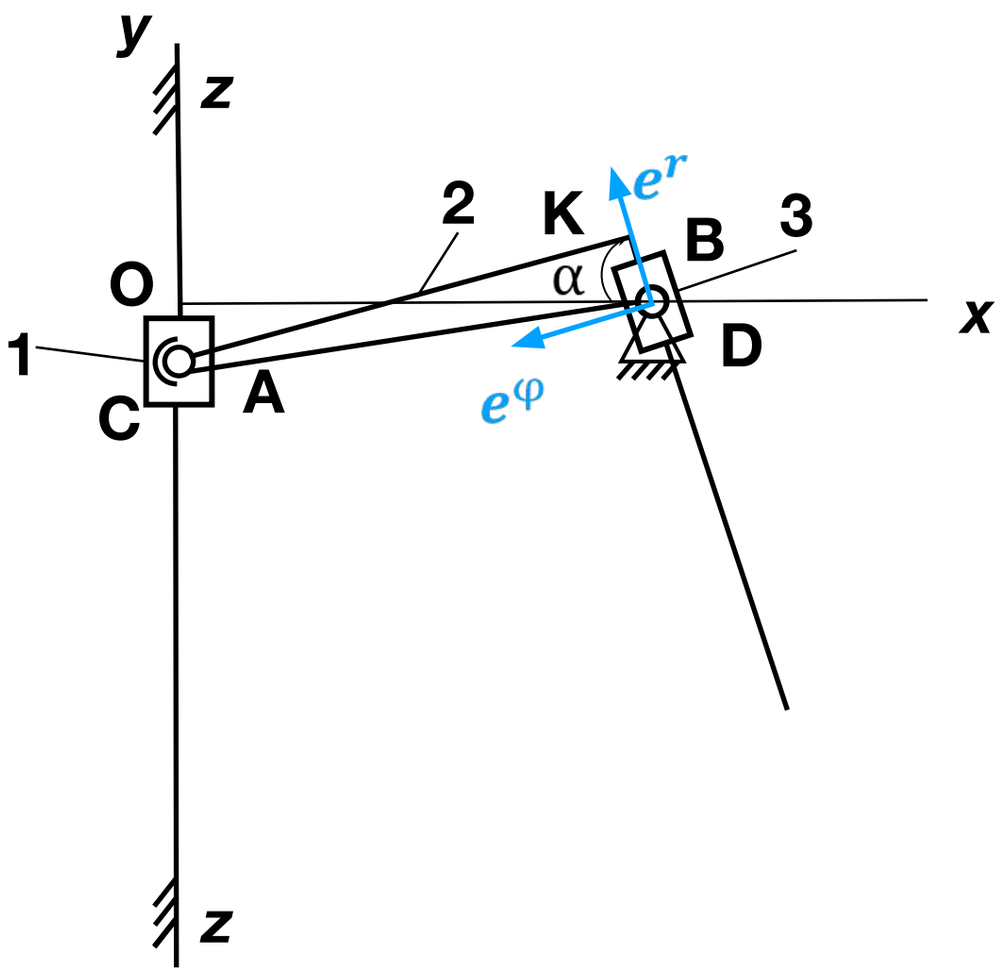
$V_{BA} \parallel KB$

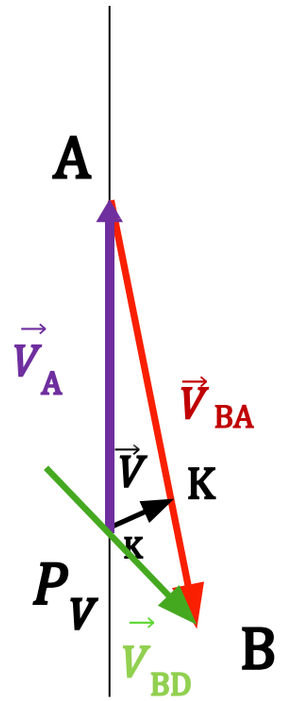
$V_A \uparrow\downarrow F,\ V_A \uparrow\downarrow Oy$

$V_{BD} \perp AB$



6. $\alpha = \frac{5\pi}{12}$





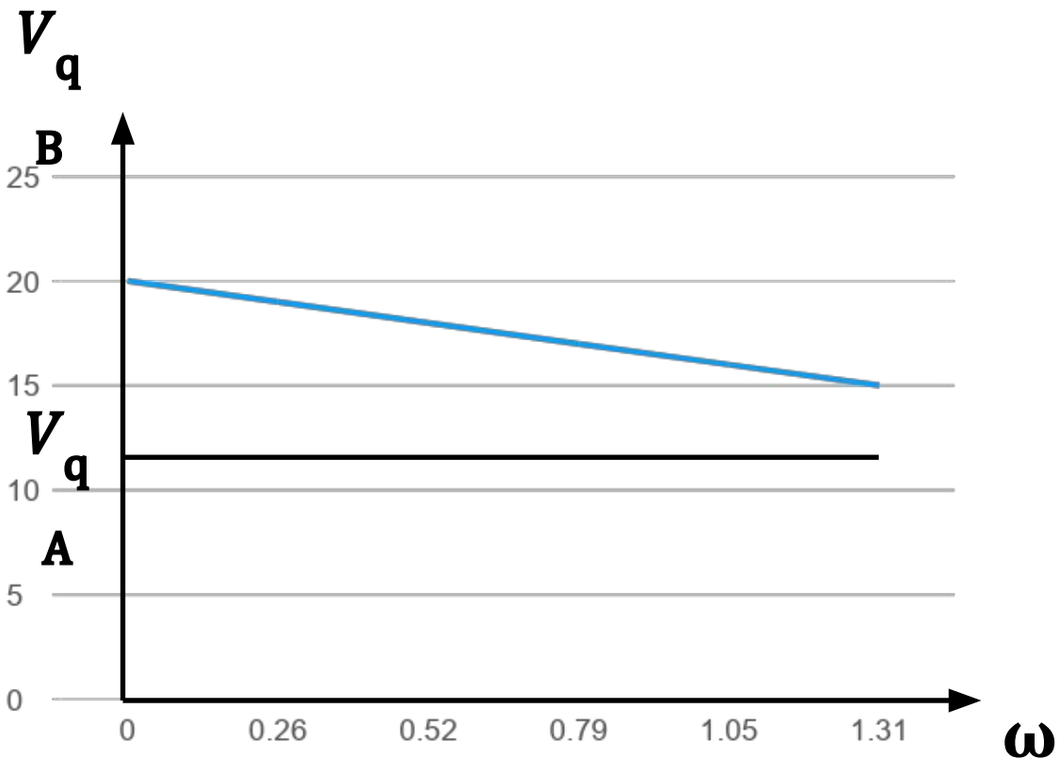
$V_{BA} \parallel KB$

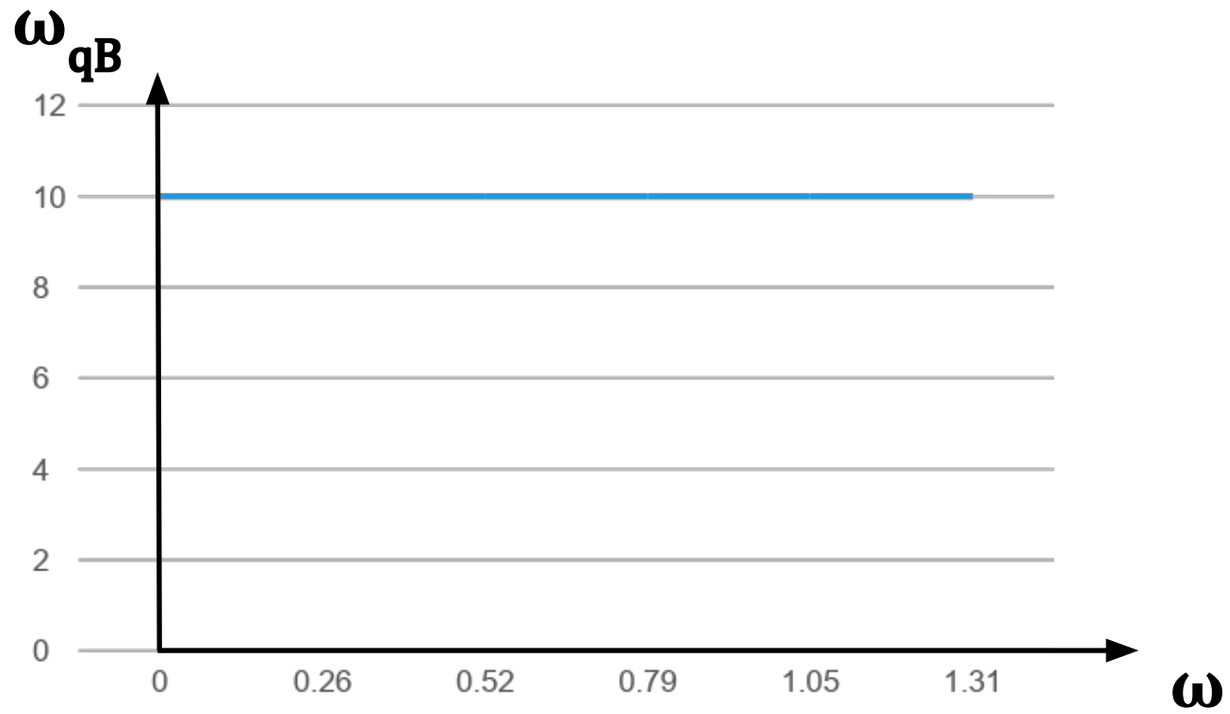
$V_A \uparrow\downarrow F,\ v_A \uparrow\downarrow$

Oy

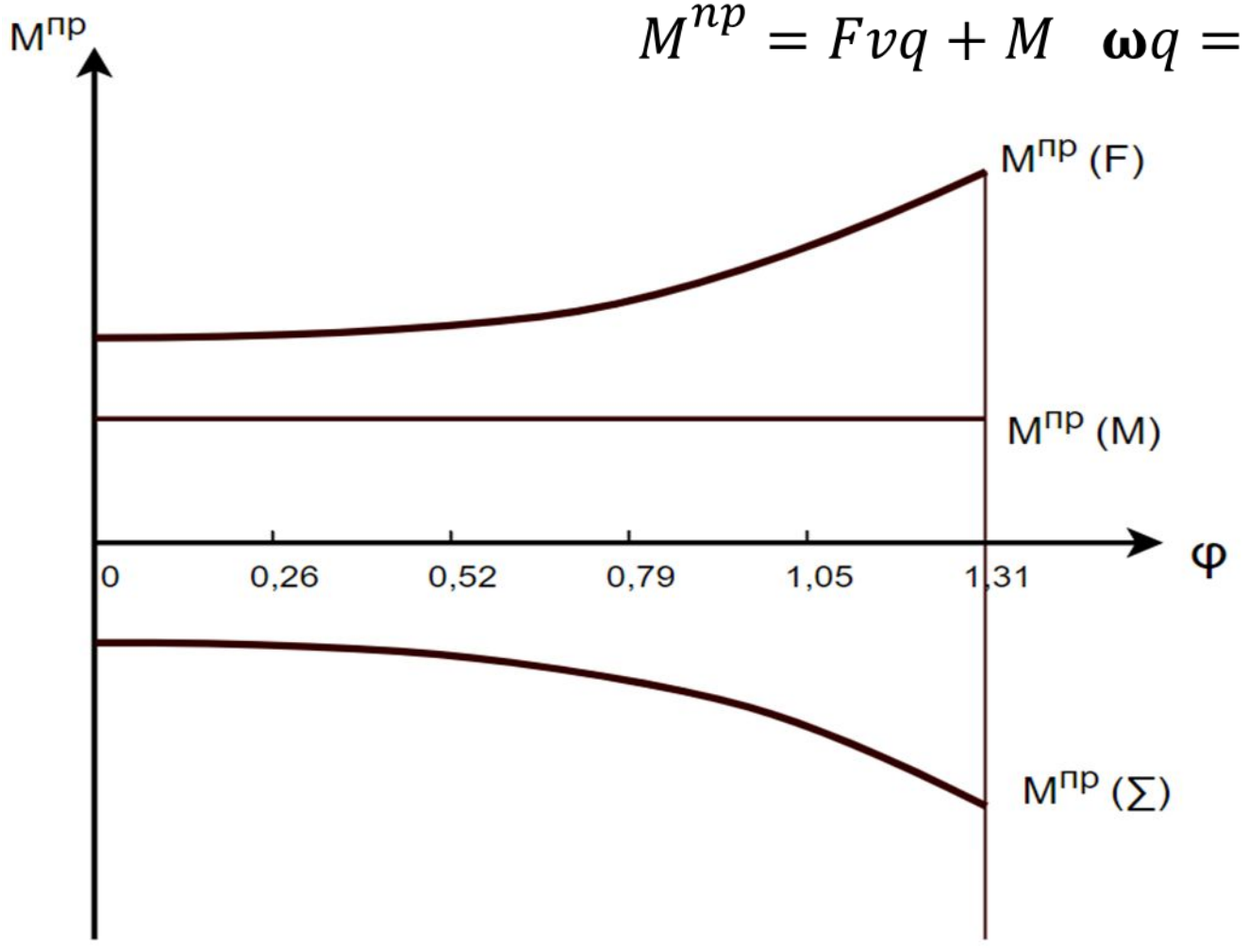
$V_{BD} \perp AB$

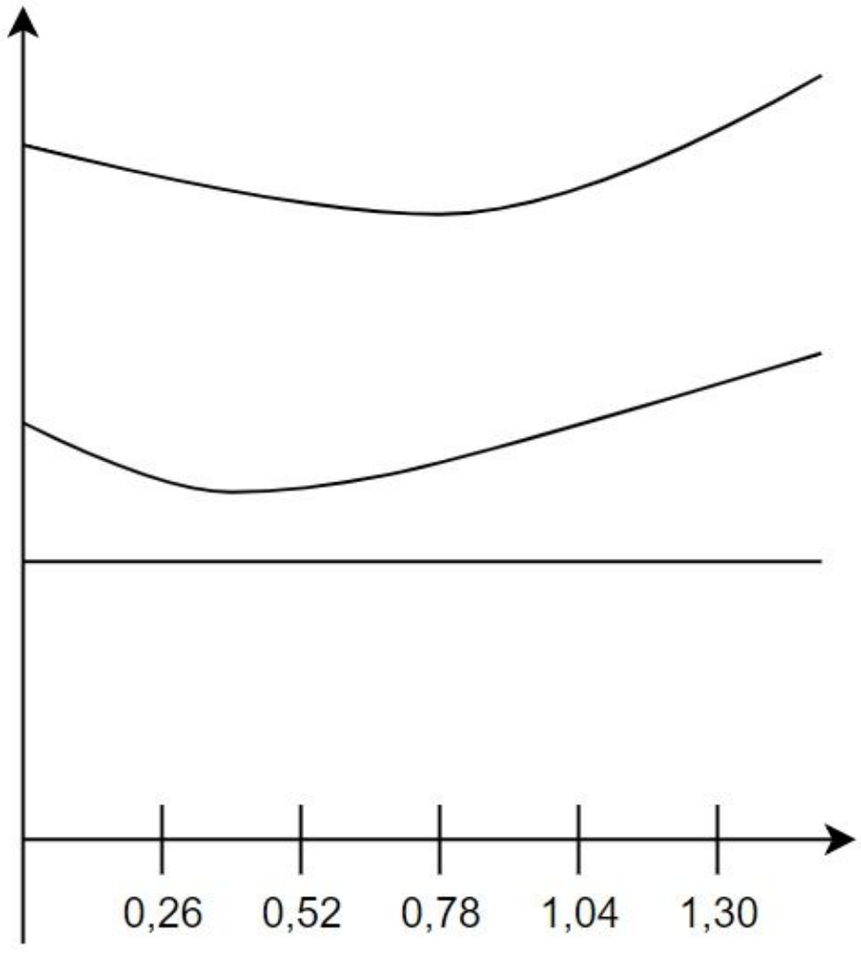
$$\begin{cases} V_B = V_A + V_{BA} \\ V_B = V_D + V_{BD} \end{cases}$$

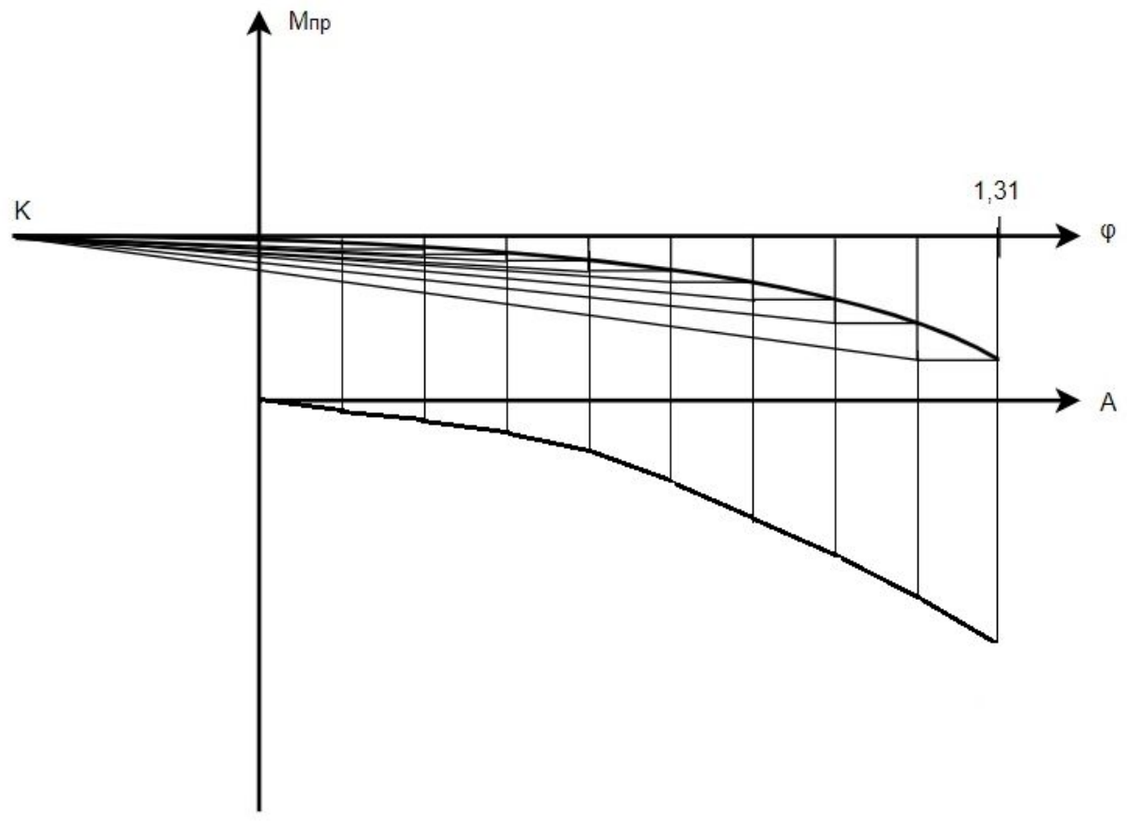




$$M^{np} = Fvq + M \quad \boldsymbol{\omega} q = -Fvqb + M\boldsymbol{\omega} \quad q$$




Iпр (Σ)
mVqs2
Iwq2
0,26
0,52
0,78
1,04
1,30


Mпр
K
1,31
φ
A