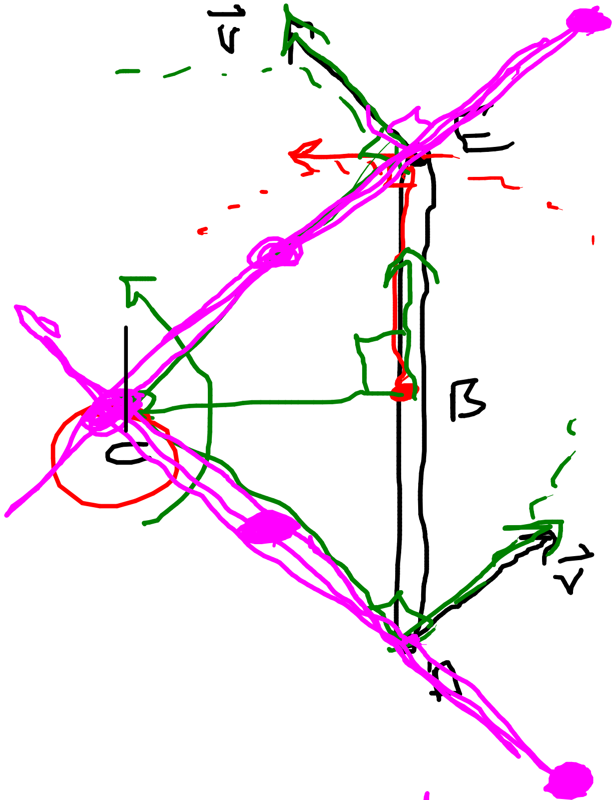
2nd chance exams

HW6 delayed 1 week.

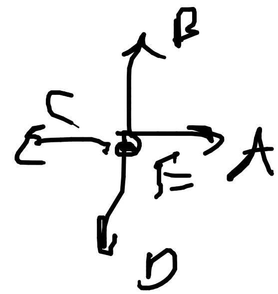
Ertekin on Wed.

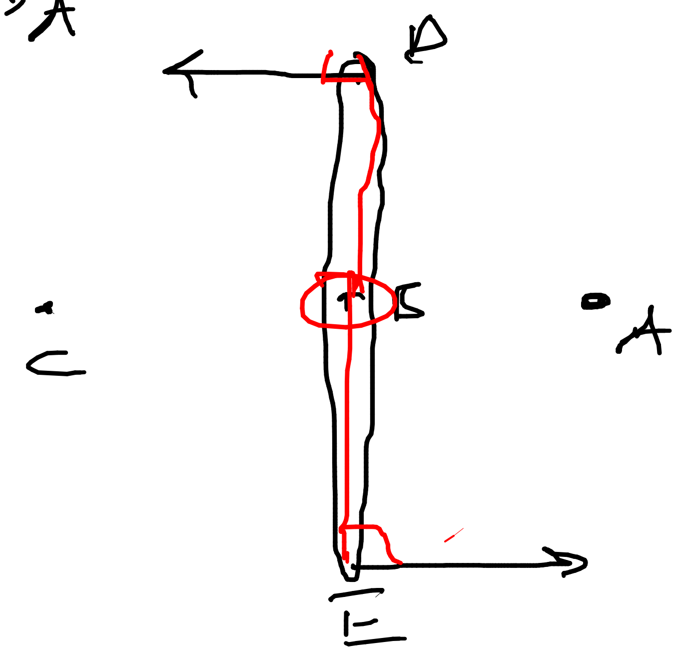
Instantaneous centers

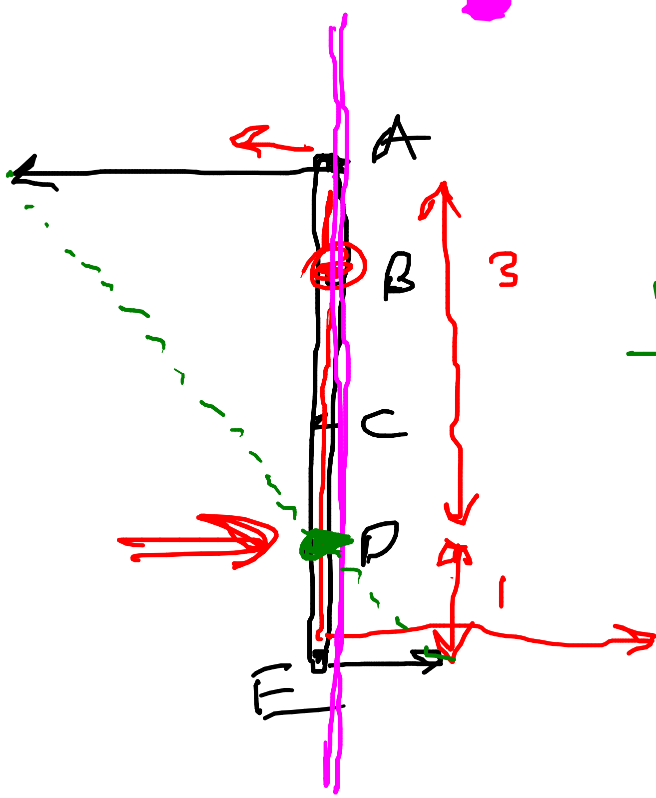
- RB moving in 2D
- IC (M) = point that is not moving
  - $\Rightarrow$ RB rotating about M.
- If $\omega \neq 0$, then M exists (2D)



$\hat{V}_B$







$v = \omega r$

$$\frac{v_A}{v_E} =$$

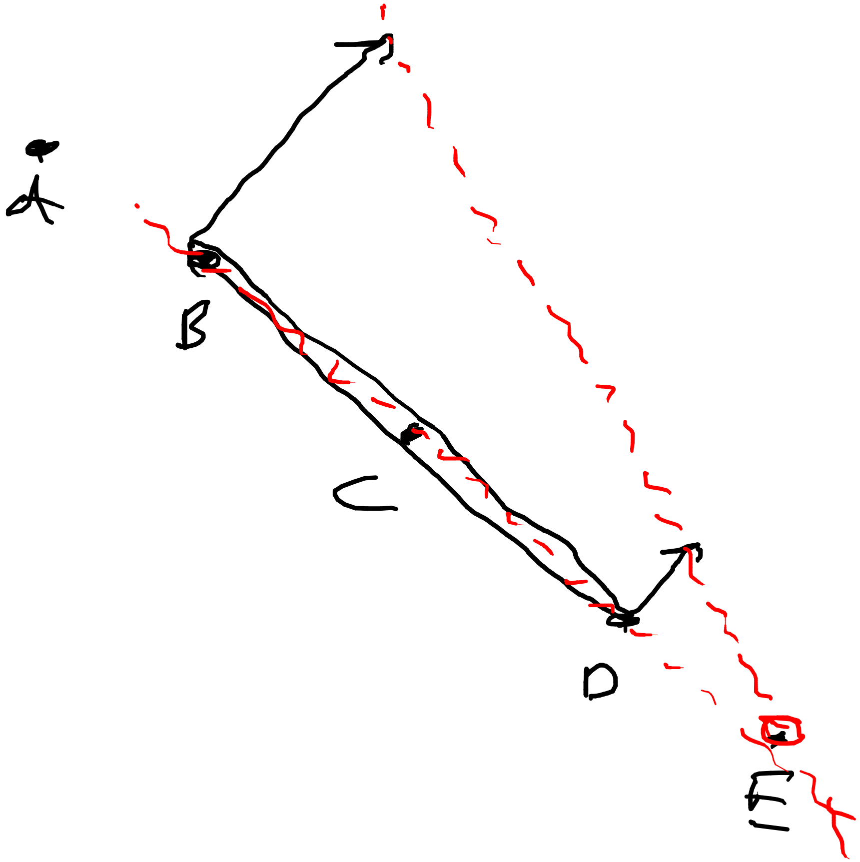
A. 2

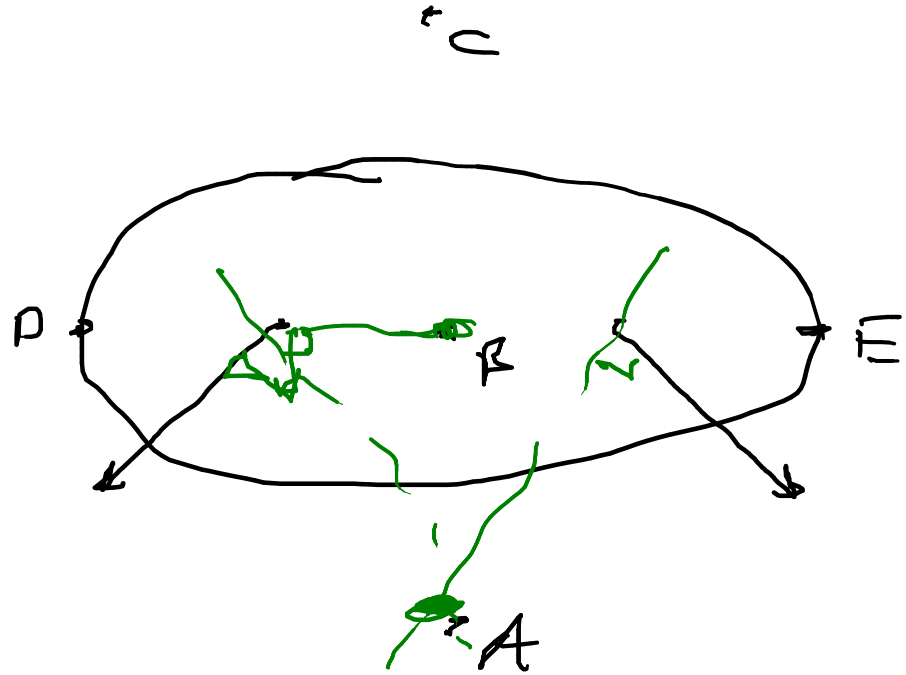
B. 3

C. 4

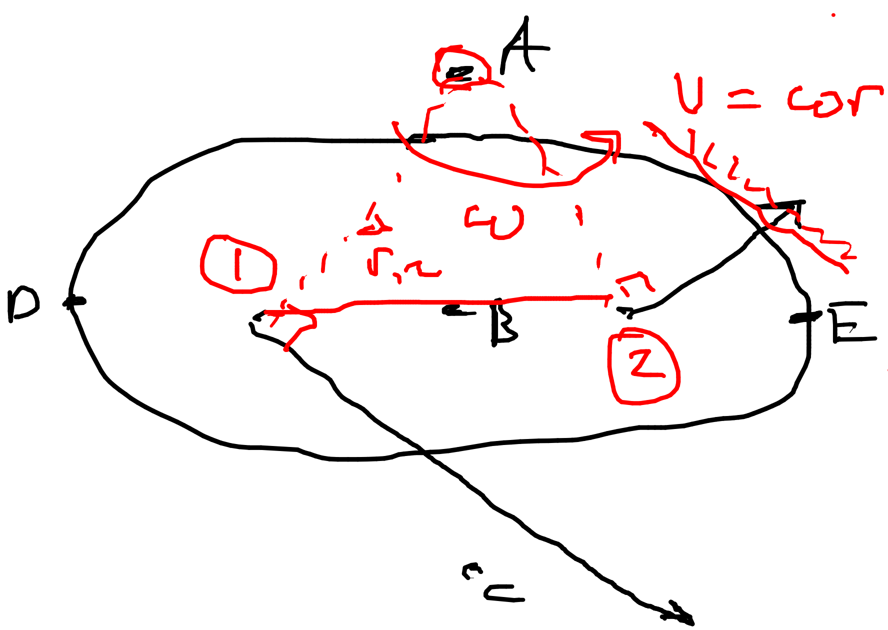
D. 5

E. 6

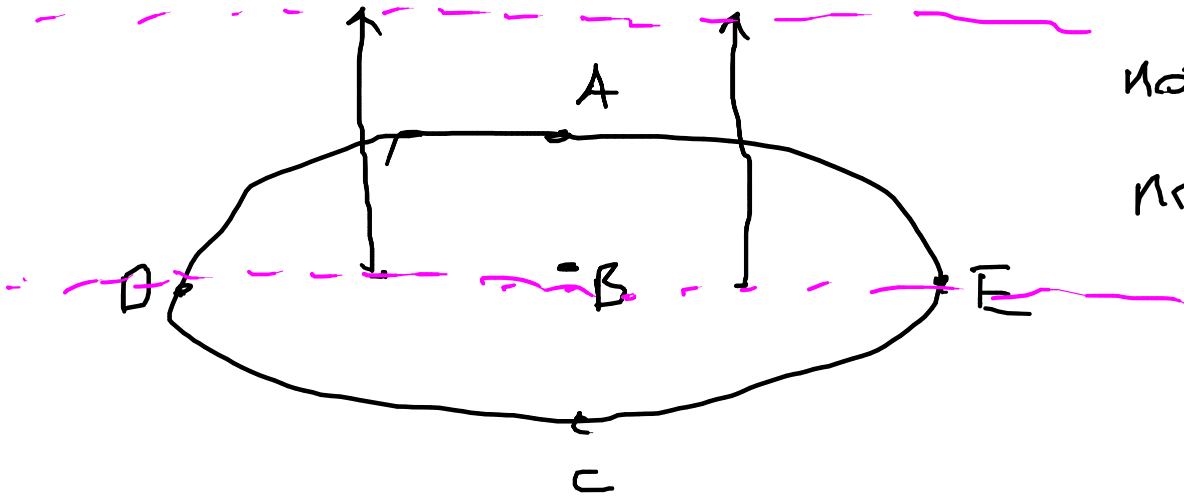




Trick. Impossible for RB.



Impossible for RB.



not rotating
no IC

Graphical Rules for finding M:

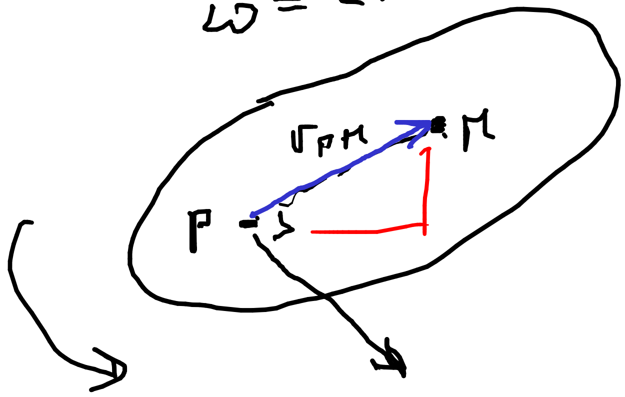
1. Draw lines perpendicular to velocities
   intersect $\Longrightarrow$ M

Fails $\Longrightarrow$ 2. Draw line through $\vec{v}$ tips
   intersect $\Longrightarrow$ M

Careful: - consistent dir of rotation
- consistent mag v $\quad v = \omega r$

Calculate

$\vec{\omega} = 2\hat{k}$



$\vec{v}_P = \hat{i} - \hat{j}$ m/s

Ex

$\vec{r}_{PM} = \_\_\_\,\hat{i} + \_\_\_\,\hat{j}$ m

A. $\sqrt{2}$

B. 1

C. 2

D. $\frac{1}{\sqrt{2}}$

E. $\frac{1}{2}$

mag

$\frac{1}{\sqrt{2}}$ ✓

$$\boxed{r_{PM} = \frac{v_P}{\omega}}$$

$\frac{\sqrt{2}}{2}$

M?

$\vec{r}_{PM}$?

use $v_P = \omega r_{PM}$

$$0 = \vec{v}_M = \vec{v}_P + \omega_z \vec{r}_{PM}^{\,\perp}$$

$$\Rightarrow \vec{r}_{PM}^{\,\perp} = -\frac{1}{\omega_z}\vec{v}_P$$

$$-\vec{r}_{PM} = \vec{r}_{PM}^{\,\perp\perp} = -\frac{1}{\omega_z}\vec{v}_P^{\,\perp}$$

$$\boxed{\vec{r}_{PM} = \frac{1}{\omega_z}\vec{v}_P^{\,\perp}}$$

$$\boxed{\vec{r}_{PM} = \frac{1}{\omega^2}\vec{\omega}\times\vec{v}_P}$$

<u>Note</u> M is not fixed.