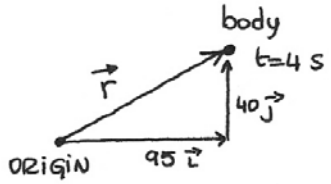
① ⓐ The equation of the position vector is

$$\vec{r} = (-5 + 25t)\,\vec{i} + 10t\,\vec{j} \ (m)$$

ⓑ The position of the body when $t = 4\,s$ is

$$\vec{r}_{t=4} = (-5 + 25 \times 4)\,\vec{i} + 10 \times 4\,\vec{j} \ (m)$$

$$\vec{r}_{t=4} = 95\,\vec{i} + 40\,\vec{j} \ (m)$$



ⓒ The position when the body hits the wall

1. Condition: it hits the wall ⟷ $y = 45\ m$

↓

2. Calculate the time ⟷ $y = 45\ m = 10\,t$

$$t = \frac{45}{10} = 4.5\ s$$

↓

3. Calculate the position ⟷ $y = 45\ m$

$$x = -5 + 25 \times 4.5 = 107.5\ m$$

$$\vec{r} = 107.5\,\vec{i} + 45\,\vec{j} \ (m)$$

ⓓ The displacement is

$$\Delta\vec{r} = \vec{r} - \vec{r}_0 = (107.5\,\vec{i} + 45\,\vec{j}) - (-5\,\vec{i}) = 112.5\,\vec{i} + 45\,\vec{j} \ (m)$$

ⓔ The magnitude (modulus of the vector) and direction (the angle with X axis) are:

$$|\vec{v}| = \sqrt{\left(25\tfrac{m}{s}\right)^2 + \left(10\tfrac{m}{s}\right)^2} = 26.93\tfrac{m}{s}$$

$$\alpha = \tan^{-1}\frac{v_y}{v_x} = \tan^{-1}\frac{10}{25} = 21.8^\circ$$

② "A" body

↳ initial position : $x_{0A} = 0$; $y_{0A} = 0$

↳ velocity : $v_{0x} = \frac{500\,m}{40\,s} = 12.5\,\frac{m}{s}$; $v_{0y} = 0$

↳ equation of the position vector

$$\vec{r}_A = 12.5\,t\,\vec{i} \quad (m)$$

"B" body

↳ initial position : $x_{0B} = 500\,m$; $y_{0B} = 0$

↳ velocity : $v_{0x} = \frac{1000\,m - 500\,m}{50\,s} = 10\,\frac{m}{s}$; $v_{0y} = 0$

↳ equation of the position vector

$$\vec{r}_B = (500 + 10t)\,\vec{i}\ (m)$$

Condition: they pass each other

↳ means → $\vec{r}_A = \vec{r}_B$ or $x_A = x_B$

Time: $12.5\,t = 500 + 10\,t \rightarrow t = \frac{500}{2.5} = 200\,s$ WHEN

Position: $x_A = x_B = 12.5 \times 200 = 2500\,m$ WHERE