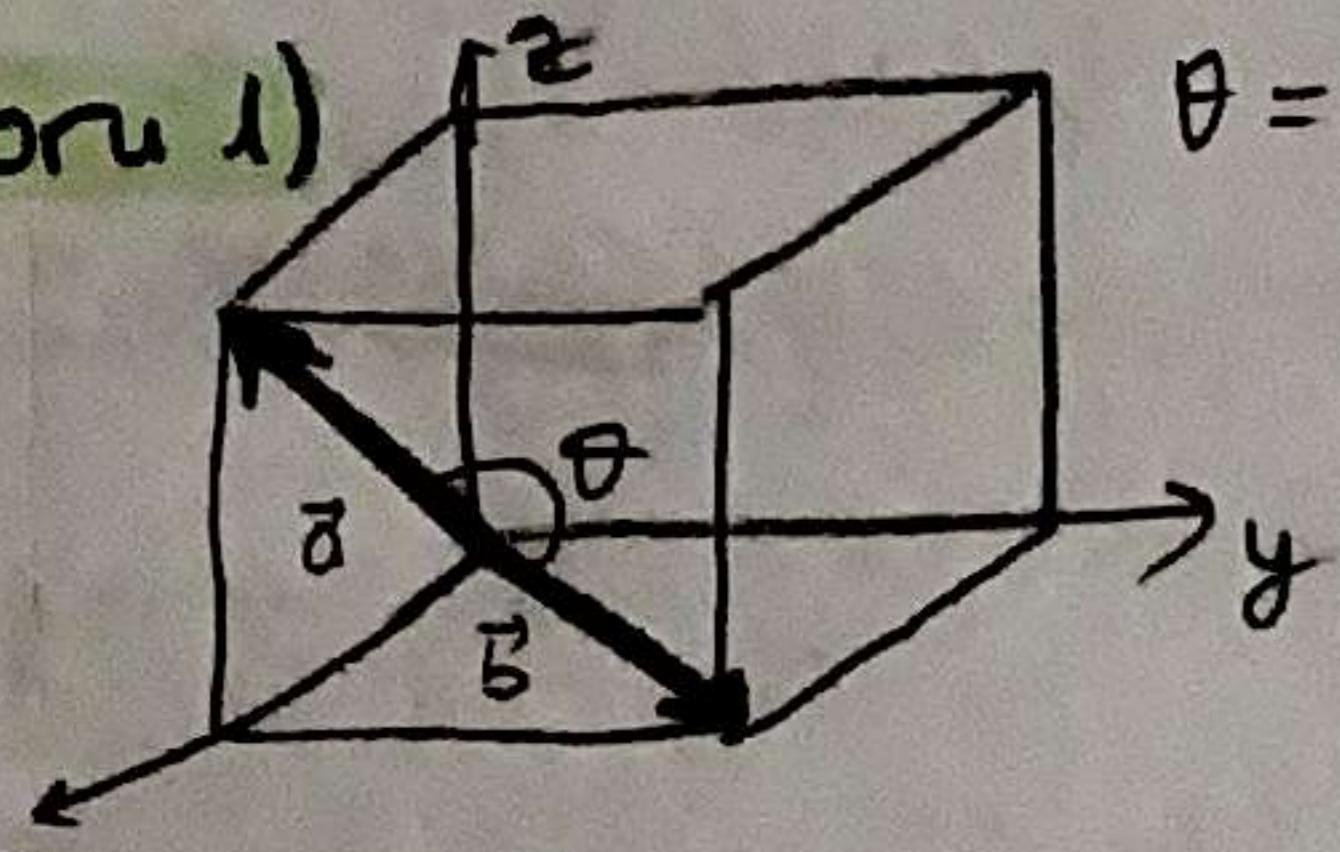
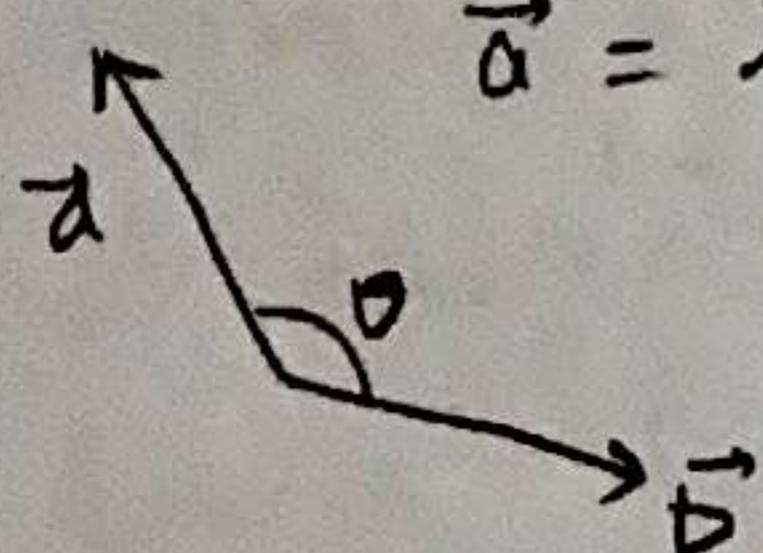


## Sinava Hazırlık

Soru 1)



$$\theta = ?$$



$$\vec{a} = \hat{i} + \hat{k} \quad \vec{b} = \hat{i} + \hat{j}$$

$$\cos\theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} = \frac{(\hat{i} + \hat{k}) \cdot (\hat{i} + \hat{j})}{\sqrt{2} \cdot \sqrt{2}} = \frac{1}{2} = \cos\theta \quad \arccos\left(\frac{1}{2}\right) = 60^\circ$$

Soru 2)  $\vec{a} = \hat{i} - 3\hat{j} + 2\hat{k}$  (m) ve  $\vec{b} = 2\hat{j} - 4\hat{k}$  (m)

a)  $\vec{a}$  ve  $\vec{b}$  vertesinde bir paralelkenarın kenarları ise olası?

$$\vec{a} = \hat{i} - 3\hat{j} + 2\hat{k}$$

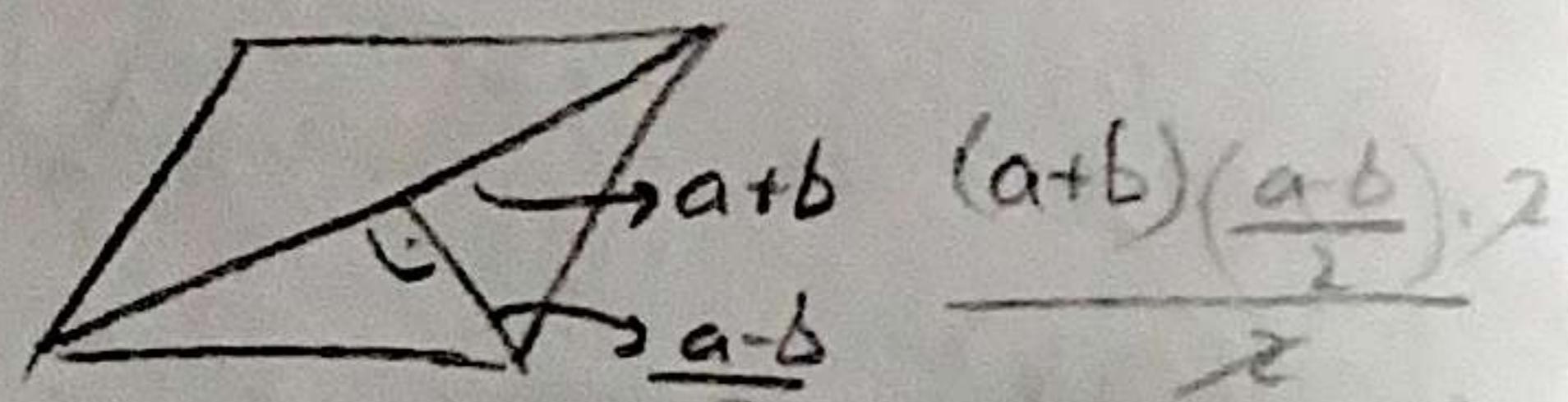
$$\vec{b} = 2\hat{j} - 4\hat{k}$$

$$\vec{a} - \vec{b} = \hat{i} - 5\hat{j} + 6\hat{k}$$

$$\vec{a} + \vec{b} = \hat{i} - \hat{j} - 2\hat{k}$$

$$\sqrt{1+25+36} = \sqrt{52}$$

$$\sqrt{1+1+4} = \sqrt{6}$$



$$\frac{2\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{2} \cdot \sqrt{3}}{2}$$

$$= 2\sqrt{21}$$

$$|\vec{a} \times \vec{b}| = |(\hat{i} - 3\hat{j} + 2\hat{k}) \times (2\hat{j} - 4\hat{k})|$$

$$|2\hat{i} + 4\hat{j} + 12\hat{k} - 4\hat{i}| = |8\hat{i} + 4\hat{j} + 2\hat{k}|$$

$$\Rightarrow \sqrt{64 + 16 + 4} = 2\sqrt{21} \text{ m}^2$$

b) Hemen  $\vec{a}$  hem de  $\vec{b}$  vertesinde dir olası birim vektör bulun.

$$\vec{a} \times \vec{b} = \vec{c} = c \cdot \vec{n} = |\vec{a} \times \vec{b}| \cdot \vec{n}$$

$$\frac{\vec{a} \times \vec{b}}{|\vec{a} \times \vec{b}|} = \frac{8\hat{i} + 4\hat{j} + 2\hat{k}}{\sqrt{84}} = \frac{4\hat{i} + 2\hat{j} + \hat{k}}{\sqrt{21}}$$

Soru 5)  $t=0$  anda  $v_0$  ile hizdeki bir ordu doğrusal bir yol boyne hizet etmektedir.  $a = -\frac{k}{2v}$  ile verilen bir ya-

racalanır. (k sabit, v herhangi bir orduur)

a) Zaman boyunca denklemini yazınız

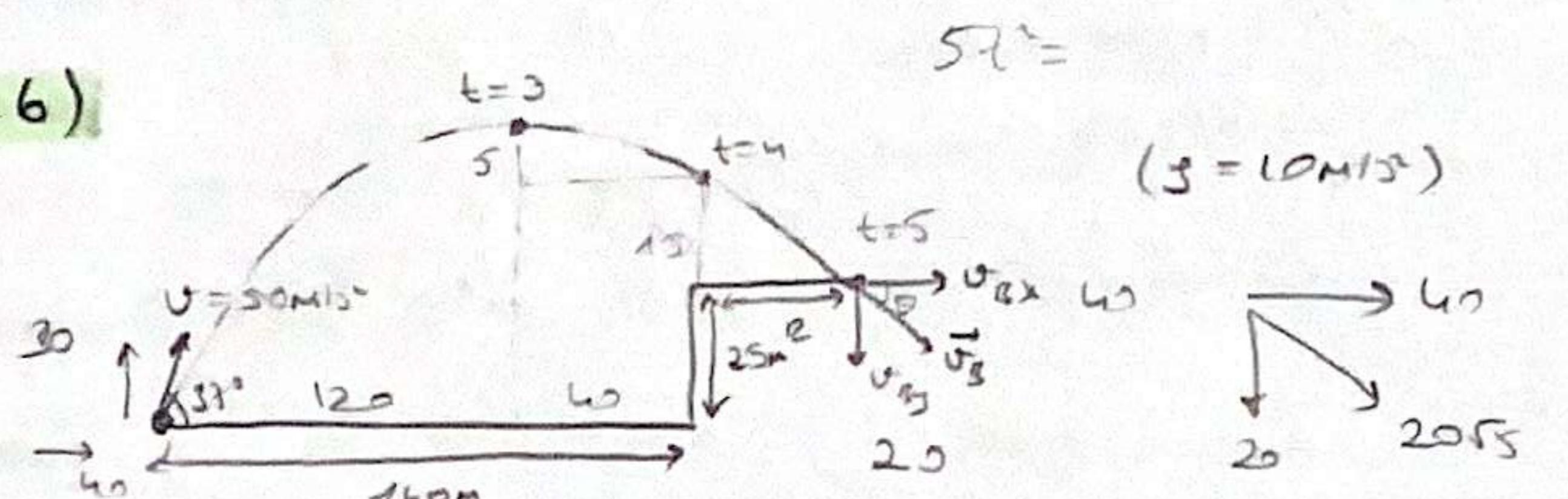
$$\frac{a}{v} = \frac{dv}{dt} \quad -k \cdot dt = 2v \cdot dv$$

$$\int_{v_0}^v 2v \cdot dv = \int_0^t -k \cdot dt$$
$$v^2 - v_0^2 = -kt \Rightarrow v = \sqrt{v_0^2 - kt}$$

b) Arabanın durusunu  $t=0$  dan geceye

$$v = \sqrt{v_0^2 - kt} \Rightarrow t = \frac{v_0^2}{k}$$

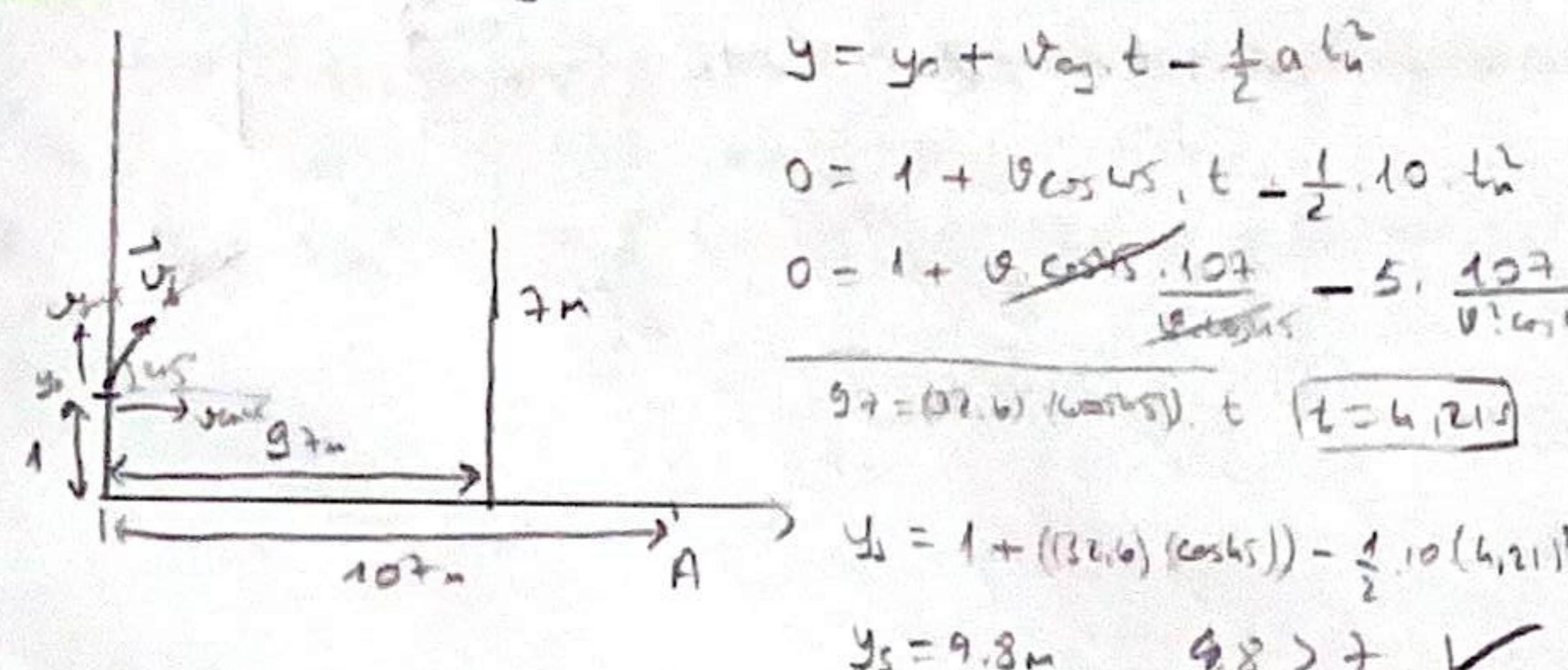
Soru 6)



a)  $R = ?$   $[R = 40 \text{ m}]$

b)  $\theta = ?$   $|v_s| = ?$   $\theta = \arctan(-\frac{1}{2})$   $v_s = 20\sqrt{5}$

Soru 7) Top fırlatılı asansör mi?  $107 \text{ m} = \text{Atış uzaklığı}$



$$y = y_0 + v_{0y}t - \frac{1}{2}gt^2$$

$$0 = 1 + 10 \cos 45^\circ t - \frac{1}{2} \cdot 10 \cdot t^2$$

$$0 = 1 + 10 \cos 45^\circ \frac{107}{v_0 \cos 45^\circ} - 5 \cdot \frac{107^2}{v_0^2 \cos^2 45^\circ}$$
$$9.8 = (32.6) \frac{107}{v_0 \cos 45^\circ} \cdot t \quad |t = 4.21 \text{ s}$$

$$y_1 = 1 + ((32.6) (\cos 45^\circ)) - \frac{1}{2} \cdot 10 \cdot (4.21)^2$$

$$y_2 = 9.8 \text{ m} \quad 9.8 > + \checkmark$$

Soru 3)  $x-y$  düzleminde sabit  $v_0$  ile hizet eden bir parçacık  $t=0$  anda orijindedir, hali da  $\vec{v}_i = (4i - 3j) \text{ m/s}$  dir. 45 sonra konum  $\vec{r}_s = (6i + 8j) \text{ m}$  olduğuna göre  $v_0$  ve  $a$  türlerini bulunuz.

$$t=0 \quad x=0 \quad y=0 \quad \vec{r}_i = 0$$

$$\vec{r}_s = \vec{r}_i + \vec{v}_i t + \frac{1}{2} \vec{a} t^2$$

$$6i + 8j = 0 + (4i - 3j)t + \frac{1}{2} \cdot \vec{a} \cdot t^2$$
$$16i - 12j = \frac{1}{2} \vec{a} \cdot t^2$$
$$\frac{1}{8} \vec{a} = \frac{-10i + 20j}{t^2} \Rightarrow \vec{a} = \frac{-5i + 5j}{4} \text{ m/s}^2$$

$$\vec{v}_s = \vec{v}_i + \vec{a}t$$

$$\vec{v}_s = (4i - 3j) + \left(\frac{-5i + 5j}{4}\right)t \Rightarrow \vec{v}_s = -i + 7j \text{ m/s}$$

Soru 4)  $x$  ekseninde  $v_0$  ile hizet eden bir parçacık  $t=0$  anda  $a = -2 + 3t$  dir.  $t$  zaten,  $a$  de  $\text{m/s}^2$  dir. Parçacık  $t=4s$  andaki  $x$  koordinatının değerini  $t=0$  andaki değerle eşit olabilmesi için  $v_0$  ne olmalıdır?

$$\int -2 + 3t \Rightarrow \int -2t + \frac{3}{2}t^2 \quad -t^2 + \frac{t^3}{2} = -16 + \frac{64}{2} = 16$$

$$a = \frac{dv}{dt} \quad dv = (-2 + 3t) \cdot dt$$

$$\int_{v_0}^v dv = \int_0^t (-2 + 3t) dt \Rightarrow v - v_0 = -2t + \frac{3t^2}{2}$$

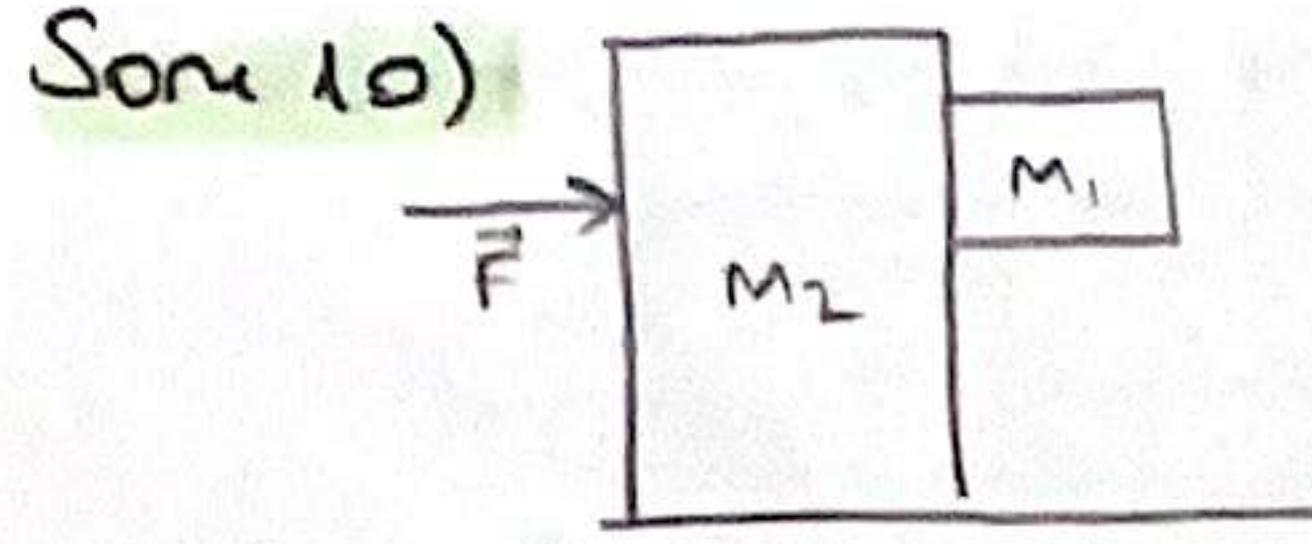
$$v = v_0 - 2t + \frac{3t^2}{2}$$

$$v = \frac{dx}{dt} \quad dx = \left(v_0 - 2t + \frac{3t^2}{2}\right) \cdot dt$$

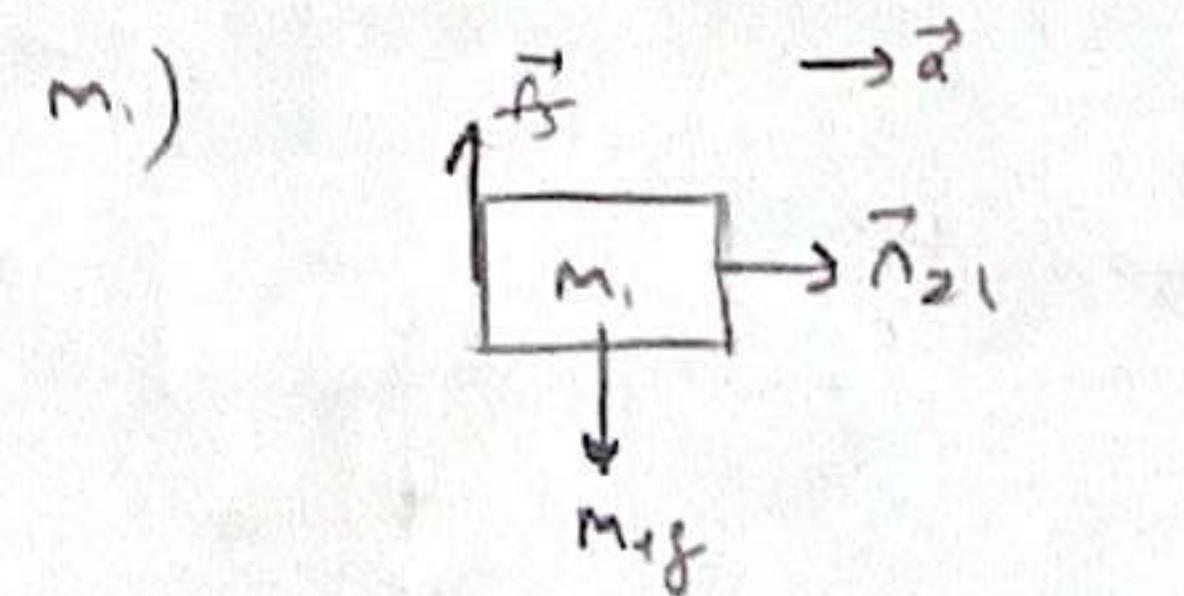
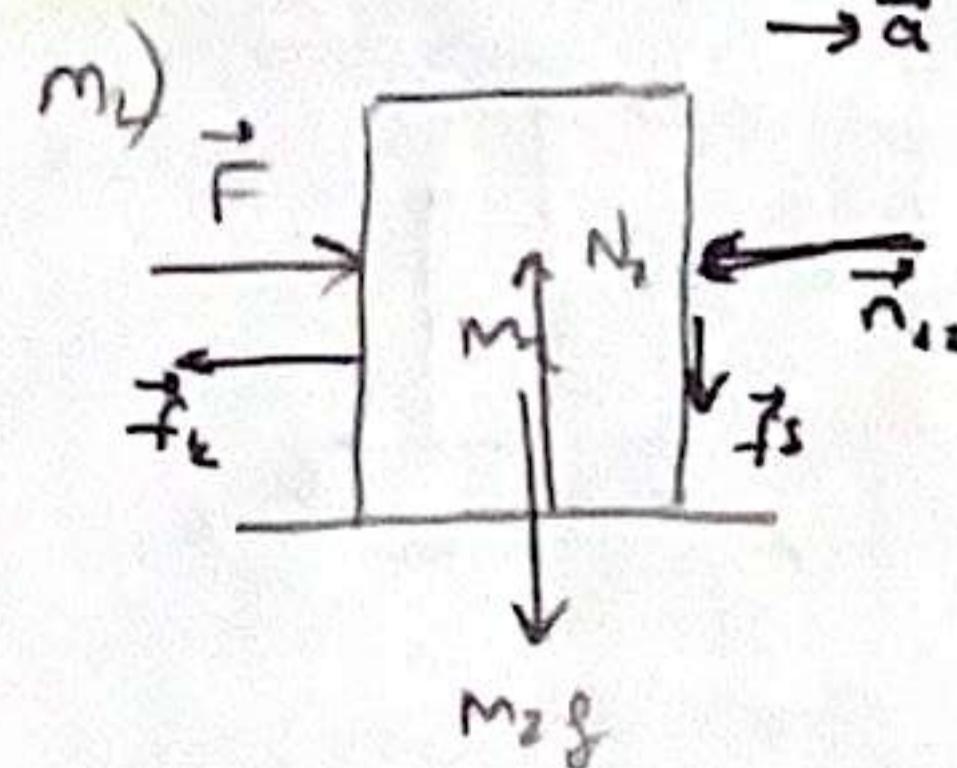
$$\int_{x_0}^x dx = \int_0^t \left(v_0 - 2t + \frac{3t^2}{2}\right) dt \Rightarrow x - x_0 = v_0 t - t^2 + \frac{t^3}{2}$$
$$(x = x_0)$$

$$0 = 4v_0 - 16 + 32$$

$$v_0 = -4 \text{ m/s}$$



a) Serbest cisim diyagramı



b) Newton hukmeleri denklemi

$$M_2: F - n_{21} - f_s = M_2 a$$

$$N_1 = f_s + M_2 g$$

$$N_1 = (M_1 + M_2) g$$

c) M<sub>1</sub>'in düşmesi için gerekli minimum F nedir?

M<sub>1</sub> kütlesi için kyma minden f<sub>s max</sub> ve F = F<sub>m</sub> olur

$$f_s = M_1 g \quad n_{21} = n_{12} = M_1 a$$

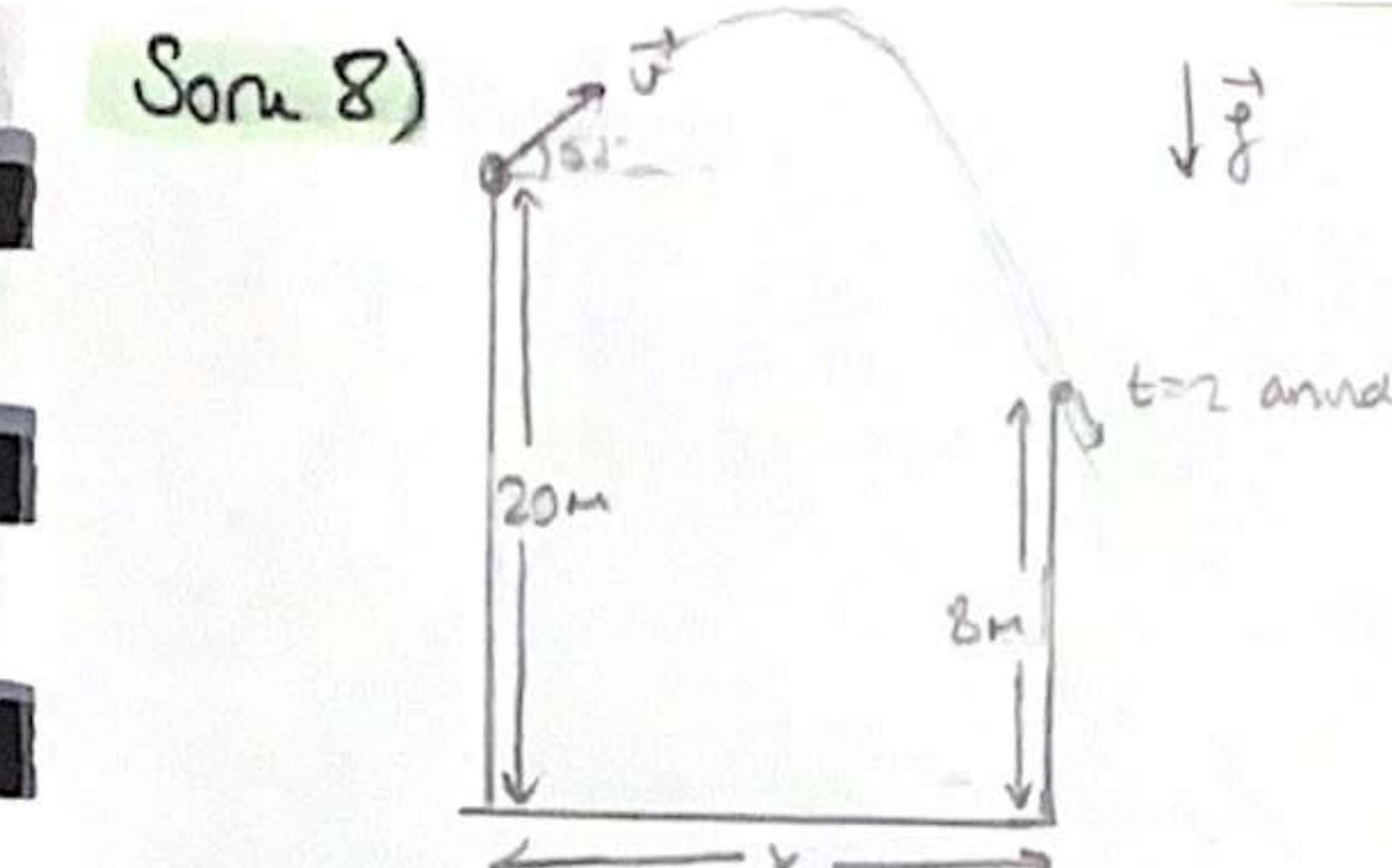
$$N_1 = (M_1 + M_2) g$$

$$f_{s max} = \mu_s n_{21} = \mu_s M_1 \cdot a = M_1 g \Rightarrow a = \frac{g}{\mu_s}$$

$$f_s = \mu_s \cdot N_1 = \mu_s (M_1 + M_2) g$$

$$F_m = M_1 a = \mu_s (M_1 + M_2) g = M_2 g \quad F_{m'} = \mu_s (M_1 + M_2) g + a(M_1 + M_2)$$

$$F_{m'} = \mu_s g (M_1 + M_2) + \frac{g}{\mu_s} (M_1 + M_2) \Rightarrow F_{m'} = g (M_1 + M_2) \cdot \left( \mu_s + \frac{1}{\mu_s} \right)$$



a)  $\vec{v} = ?$   
 $y = y_0 + v_{0y} \cdot t - \frac{1}{2} a t^2$

$$8 = 20 + v(0,8) \cdot 2 - \frac{1}{2} a \cdot 4$$

$\boxed{v = 5 \text{ m/s}}$

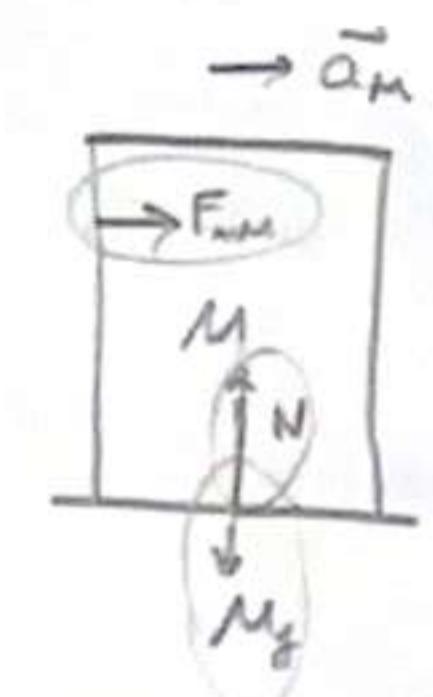
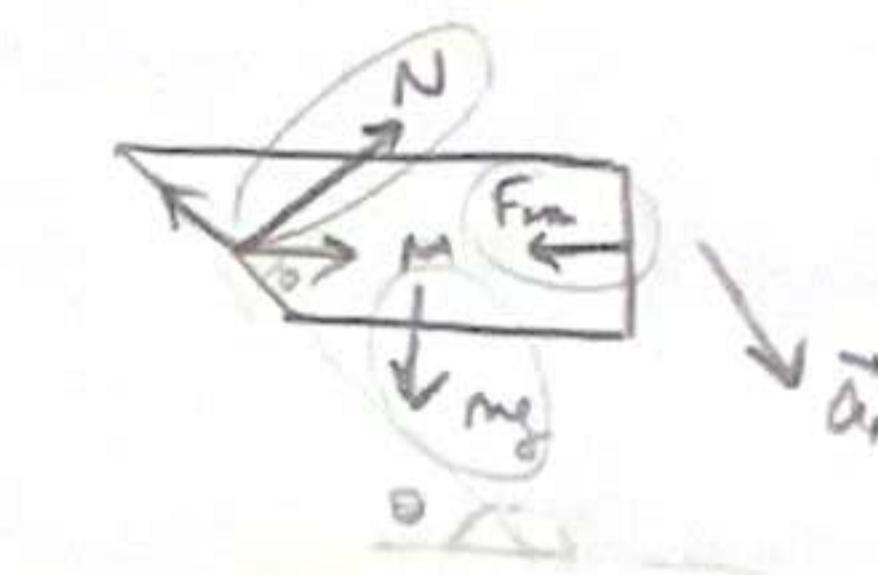
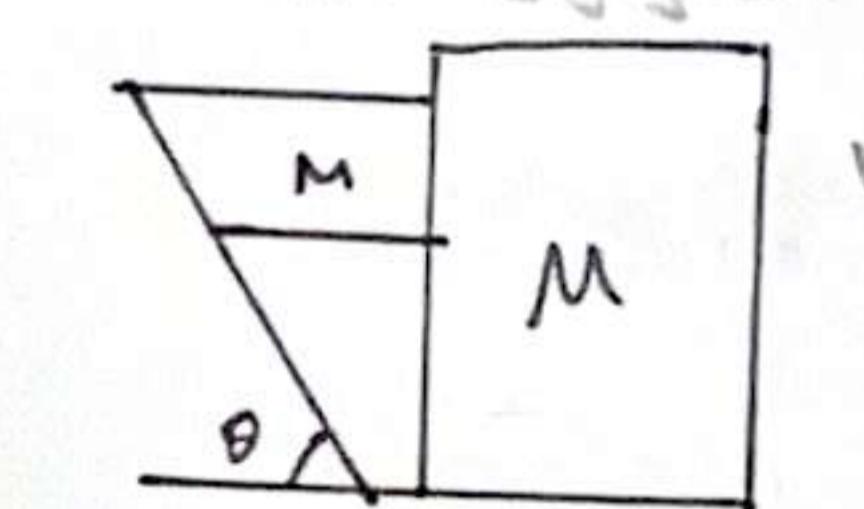
b)  $x = ?$

$$x = v_{0x} \cdot t$$

$$x = 5 \cdot (0,8) \cdot 2 \quad \boxed{x = 8 \text{ m}}$$

Soru 9) M küteli blok serbest bırakıldığından M küteli bloğun sağa doğru hızı asağı doğru hızı ile başlıyor.

a) Serbest cisim diyagramı çizimi



$$\begin{aligned} M: & N = mg \\ & F = Ma_M \\ & F = m_2 a \\ & m_2 g \sin \theta + F \cos \theta = N \\ & m_2 g \sin \theta - (M a_M) \cos \theta = m_2 a \\ & m_2 g \sin \theta - M (a_M \cos \theta) \cos \theta = m_2 a \end{aligned}$$

$$\begin{aligned} & \vec{a}_M = \vec{a}_m \cdot \cos \theta \\ & \vec{a}_M = a_M \cdot \cos \theta \end{aligned}$$

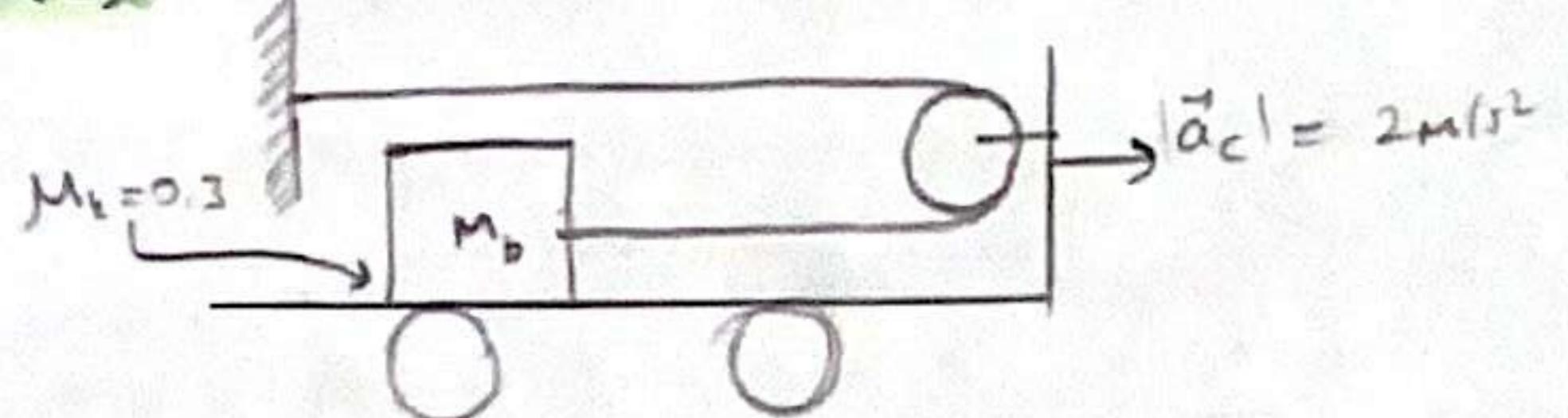
$$\textcircled{1} \quad m_2 g \sin \theta - (M a_M) \cos \theta = m_2 a$$

$$m_2 g \sin \theta - M (a_M \cos \theta) \cos \theta = m_2 a$$

$$\frac{m_2 g \sin \theta}{M \cos^2 \theta + m_2} = a_M$$

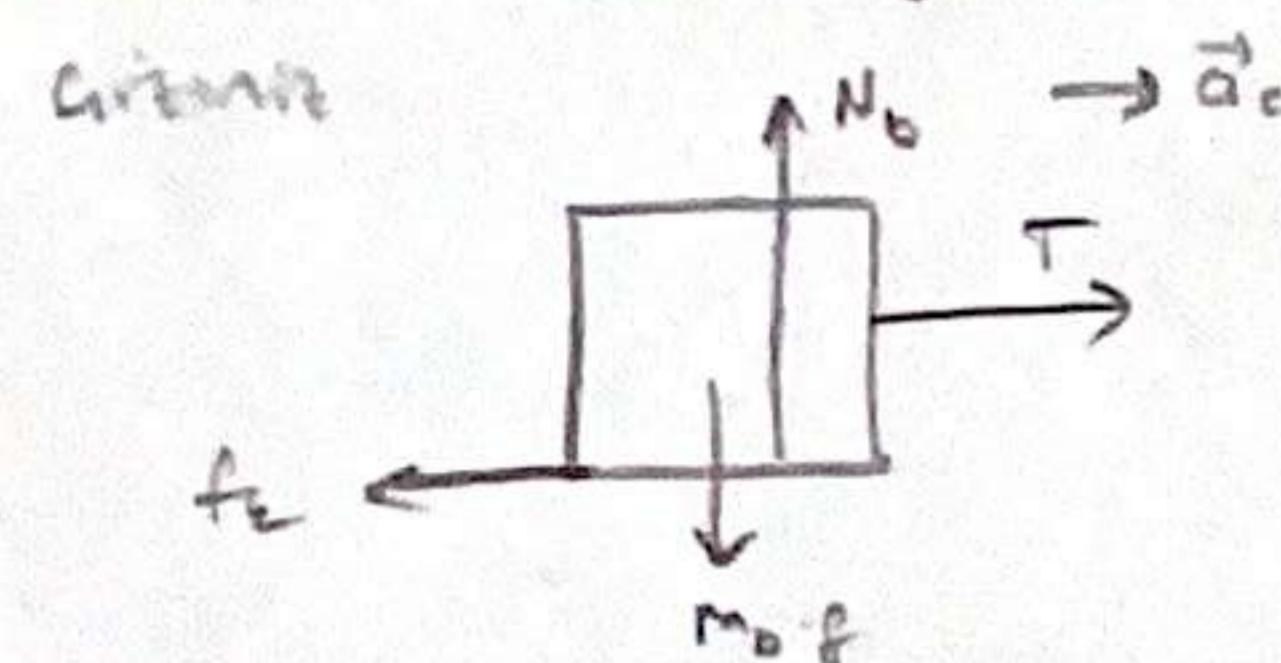
$$\frac{m_2 g \sin \theta}{2 (M \cos^2 \theta + m_2)} = a_M$$

Soru (2)



$$m_2 = 50 \text{ kg}$$

a) Yerdeki doğrultuya göre kuruş serbest cisim diyagramı

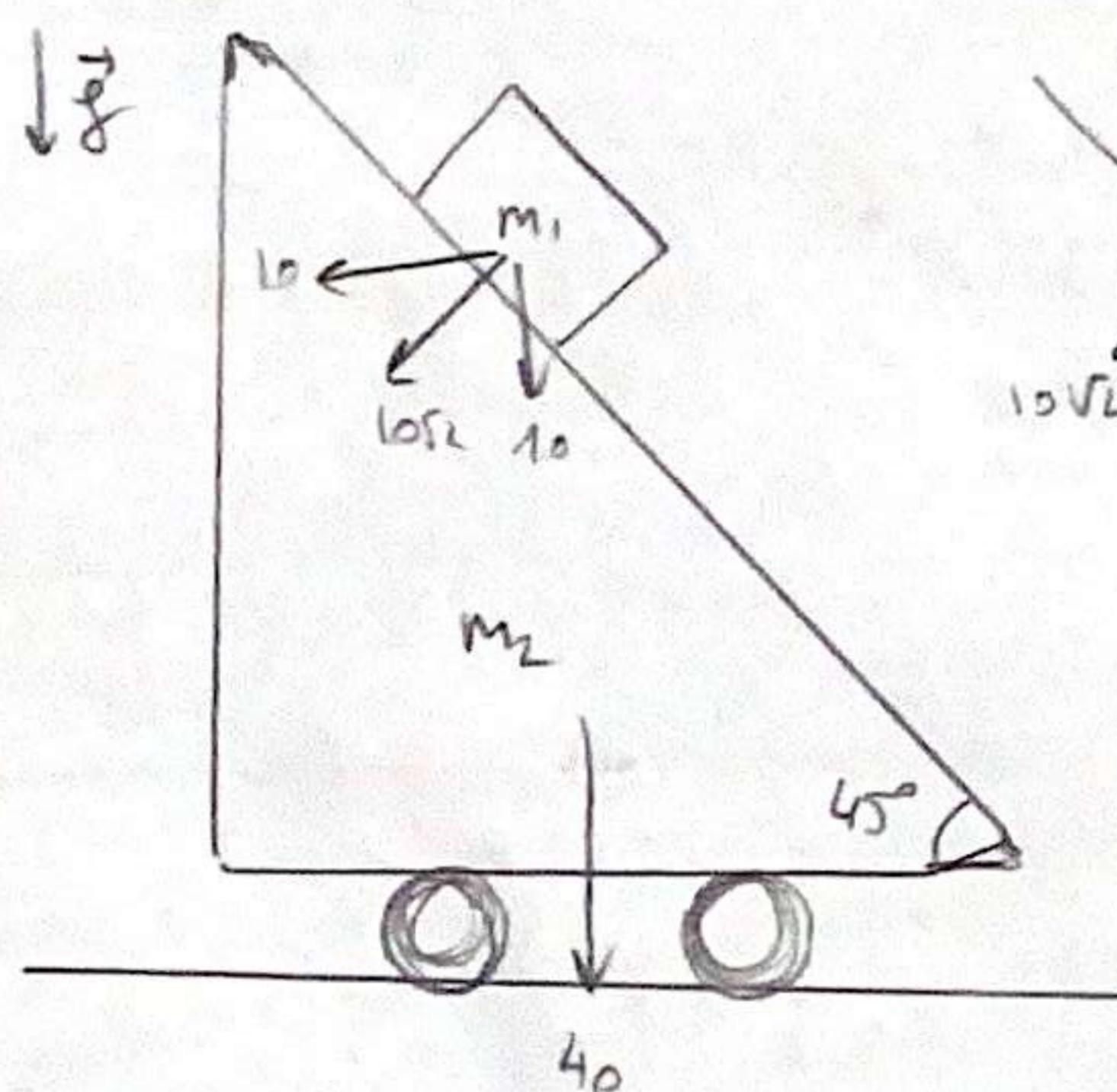


b)  $T = ?$

$$\begin{aligned} 50 \cdot 10 \cdot \frac{3}{10} &= 150 \text{ N} \\ T - 150 &= 50 \cdot 2 \text{ m/s}^2 \Rightarrow T = 350 \text{ N} \end{aligned}$$

Soru (3)  $m_1 = 2 \text{ kg}$  egrili delende asagi doğrultuya göre kaynarla  $\rightarrow m_2 = 4 \text{ kg}$  egrili delenin sola doğrultuya kaynarla

a) Bloğun egrili delene göre rume vektoru nedir?



$$\begin{aligned} 10\sqrt{2} &= 2 \cdot a_1 \\ 5\sqrt{2} &= a_1 \\ a_1 &= (5i - 5j) \text{ m/s}^2 \end{aligned}$$

$$10 = 4 \cdot a_2$$

$$2.5 = a_2$$

$$a_{1,yz} = (2.5i - 5j) \text{ m/s}^2$$

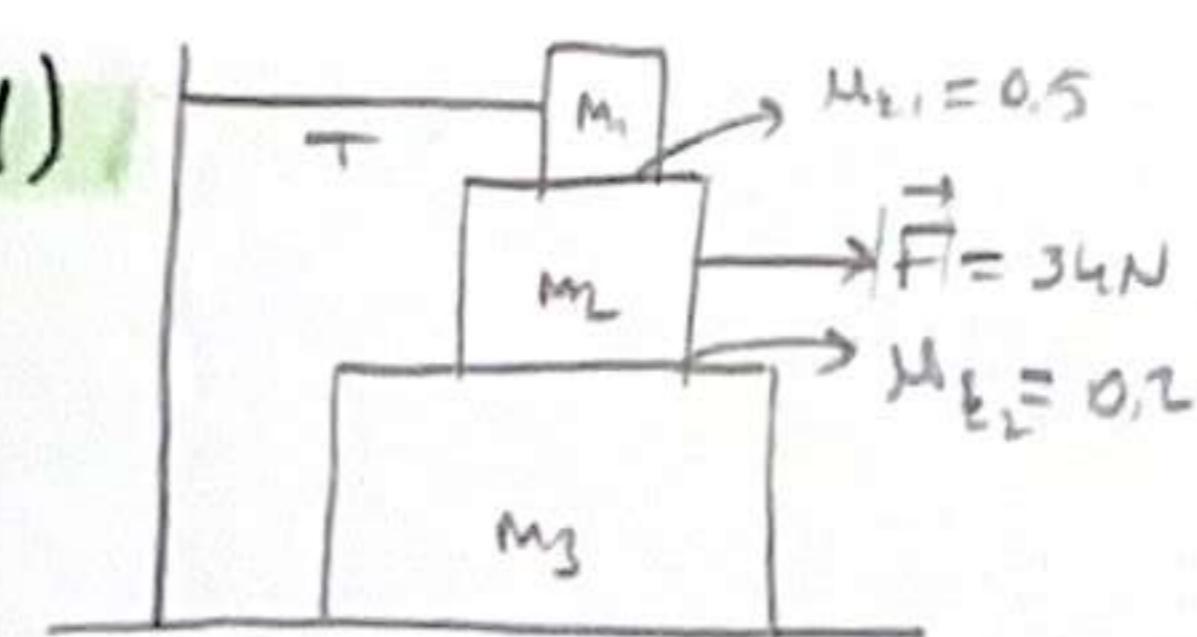
b) Bloğun yere göre rume vektoru nedir?

$$10 = 4 \cdot a_2 \quad 2.5 = a_2 \quad a_{1,yz} = (2.5i - 5j) \text{ m/s}^2$$

$$(5 - 2.5)i$$

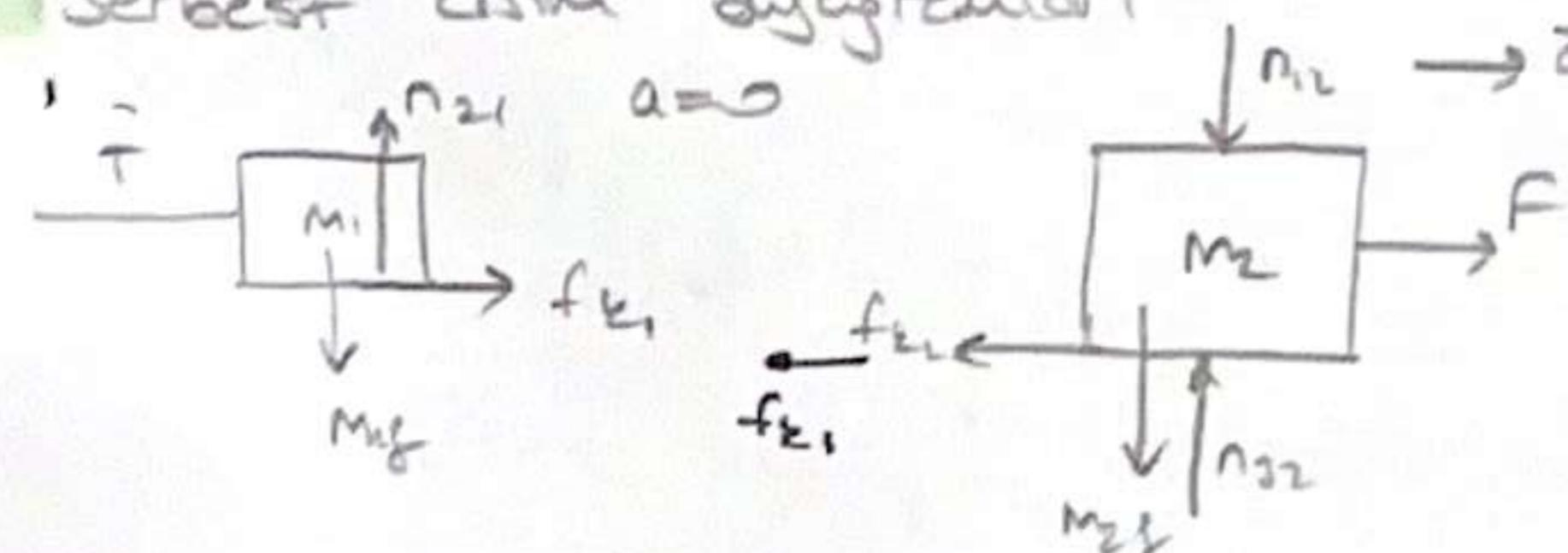
$$2.5 \rightarrow z$$

Soru (1)



$$m_1 = 2 \text{ kg}, m_2 = 4 \text{ kg}, m_3 = 6 \text{ kg}$$

a) Serbest cisim diyagramları



b)  $T = ?$ ,  $a_{m2} = ?$ ,  $a_{m3} = ?$

$$N_{21} = m_1 g \quad N_{21} = N_{12} = m_2 g = 20$$

$$f_{k1} = T \quad m_2 g \cdot \mu_k = 2 \cdot 10 \cdot \frac{5}{10} \Rightarrow 10 \quad T = 10 \text{ N}$$

$$34 - f_{k2} - f_{k3} = m_2 \cdot a_2 \quad f_{k2} = (N_{12} + m_2 g) \cdot \mu_k$$

$$(20 + 40) \cdot \frac{2}{10} \quad f_{k2} = 12$$

$$34 - 10 - 12 = 4 \cdot a_2$$

$$a_2 = 3 \text{ m/s}^2$$

$$f_{k3} = m_3 \cdot a_3 \quad 12 = 6 \cdot a_3 \quad a_3 = 2 \text{ m/s}^2$$

13) c) Blok egrili delende 3 m yol aldiginda blok egrili delenin

merke yolu olur?

$$3 = g + g_0 t + \frac{1}{2} \cdot 5\sqrt{2} \cdot t^2 \quad t^2 = \frac{3\sqrt{2}}{5} \text{ (s)}$$

$$\Delta x_{gr} = g + g_0 t + \frac{1}{2} \cdot \frac{5}{2} \cdot \frac{3\sqrt{2}}{5} \Rightarrow \Delta x_{gr} = \frac{3\sqrt{2}}{4} \text{ (m)}$$



$$M_2 \text{ horekt herket ettebbelések minimum } F \text{ körétek teljesítésére}$$

$$N_1 + T \cos \theta = M_1 g \quad f_{s1} = T \sin \theta \quad (1) \quad (M_1 g - T \cos \theta) \mu = T \sin \theta$$

$$F = f_{s1} + f_{s2} \quad N_2 = N_1 + m_2 g$$

$\hookrightarrow$  körme bálcéndre azaz f<sub>s2</sub> f<sub>s1</sub> (F=f<sub>s1</sub>)

$$F_{\text{net}} = \frac{f_{s1}}{\mu} + \mu [ (M_1 g - T \cos \theta) + m_2 g ]$$

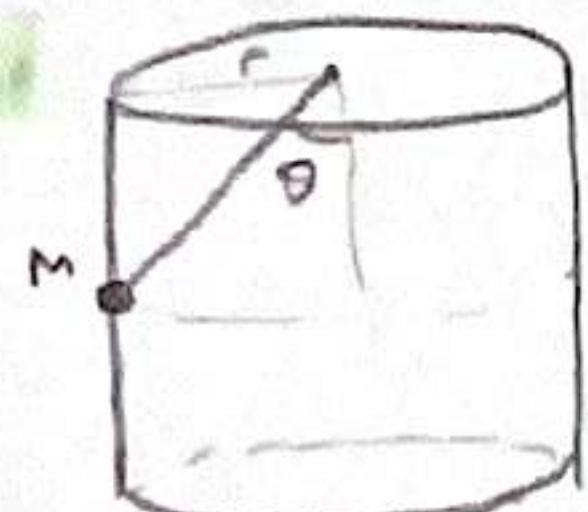
$$M_1 g - T \cos \theta \cdot \mu + \mu m_2 g - T \cos \theta \cdot \mu + m_2 g \mu$$

$$F_{\text{net}} = \mu g (2m_1 + m_2) - 2 T \cos \theta \mu$$

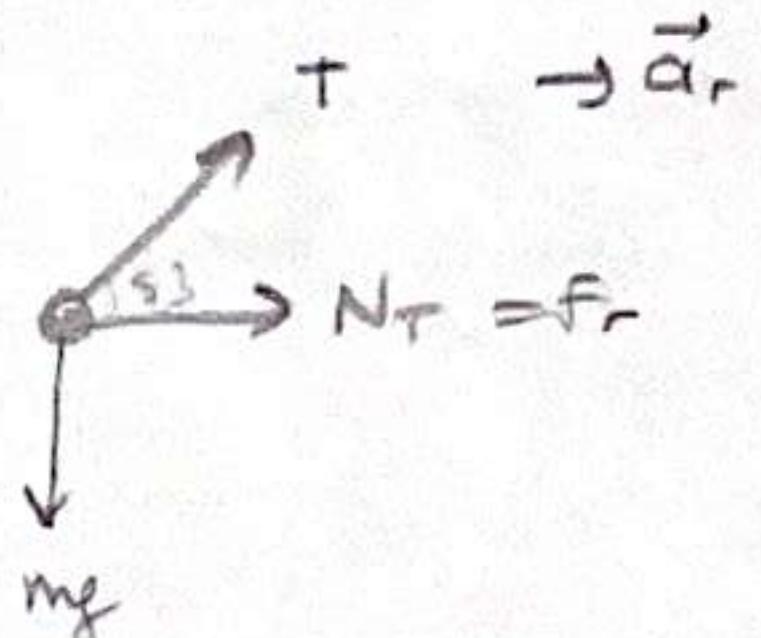
$$F_{\text{net}} = M_1 g (2m_1 + m_2) - 2 \left( \frac{\mu m_2 g}{\mu \cos \theta + \sin \theta} \right) \cos \theta \cdot \mu$$

$$F_{\text{net}} = \mu g \left[ (2m_1 + m_2) - \left( \frac{2 \cdot m_2 \cdot \cos \theta \cdot \mu}{\mu \cos \theta + \sin \theta} \right) \right]$$

Soru 22)  $r=1m, m=2kg, \theta=37^\circ$ , duvarla çökgüdeki tepeye korkut SN, (Dairesel herket yapan)



a) Serbest cosin dijagramı

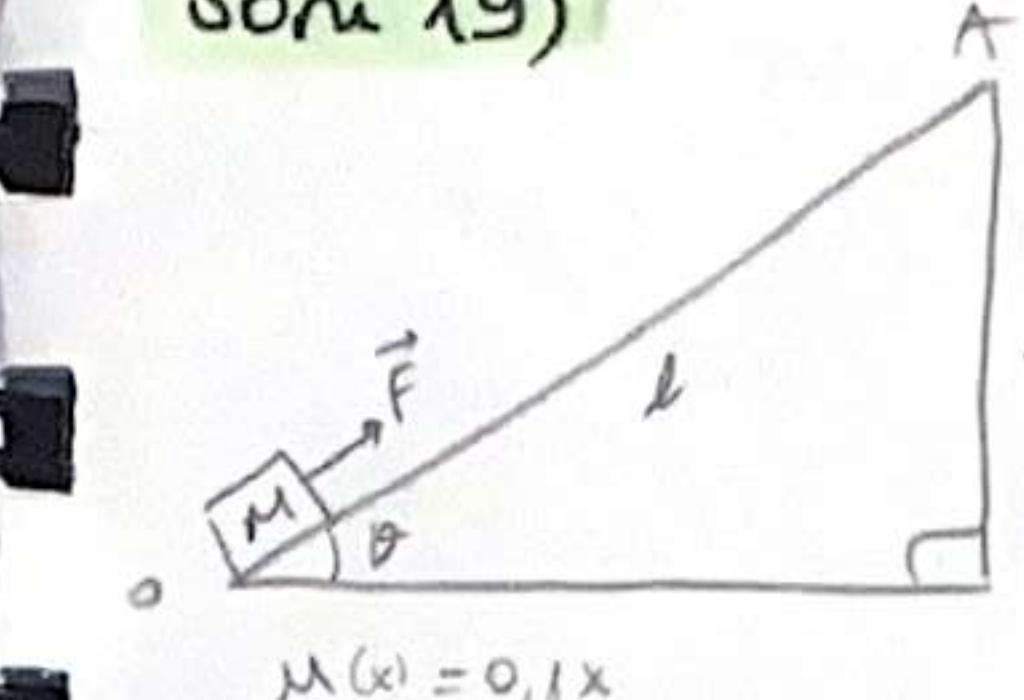


$$\begin{aligned} + \rightarrow \vec{a}_r & \quad 0.8T \\ + \downarrow & \quad 0.6T \\ 25, \frac{3}{5} & = 15 + 5 = 20 \quad T=25 \end{aligned}$$

b) Uzunlu sarti nedir?

$$20 = 2 \cdot \frac{v^2}{r} \Rightarrow v = \sqrt{10} \text{ m/s}$$

Soru 19)



$$M(x) = 0,1x$$

M horekt A rotasyonla hodek SSB'ye göre

a) Net körme yapan TS telune

$$f_s = \frac{x}{l} \cdot M g \cdot \cos \theta$$

$$F - M g \sin \theta - M g \cdot \frac{x}{l} \cdot \cos \theta = M a \quad W_{\text{net}} \rightarrow (Sob'ye göre)$$

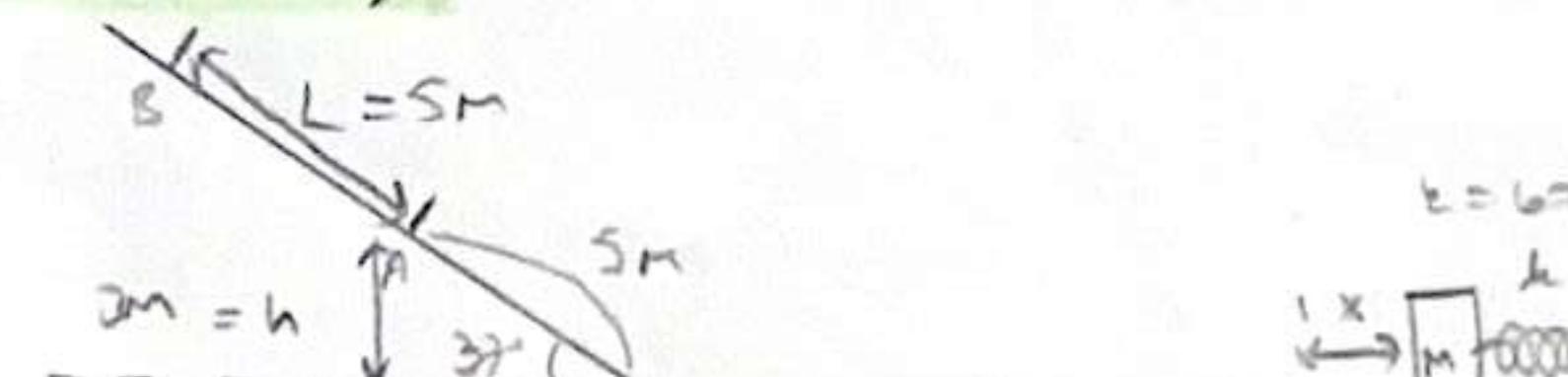
$$F = M g (\sin \theta + \frac{x}{l} \cdot \cos \theta)$$

b) F körmetin yapan TS?

$$\int F dx = \int (M g (\sin \theta + \frac{x}{l} \cdot \cos \theta)) dx = M g \left( x \sin \theta + \frac{x^2}{2l} \cdot \cos \theta \right) \Big|_0^l$$

$$\Rightarrow W_F = M g \left( l \sin \theta + \frac{l^2}{20} \cdot \cos \theta \right)$$

Soru 20)



$$\frac{1}{2} \cdot 60 \cdot x^2 = w_N + M g h + w_S$$

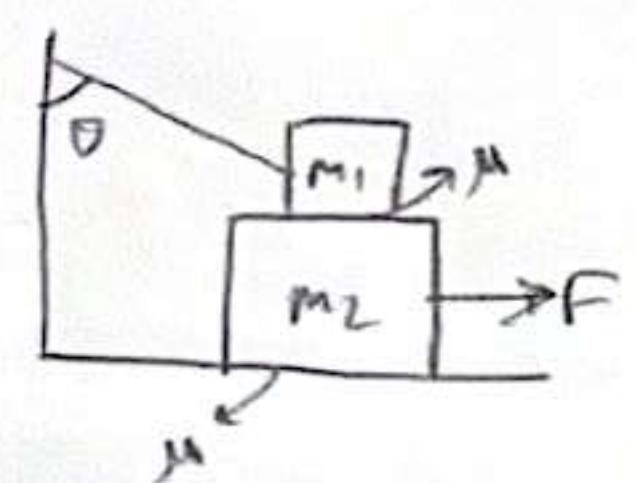
$m=1kg$ , serbest eğide körme sümme katsayı: 0,5 tür. CTS'nde B rotasyonla dönen bir yarım silindirin重心i ne olurdu?

$$W_{\text{net}} = \Delta E = k_3 - k_1 = 0 \quad f = kx \quad \text{bu } x = 1.0 \text{ a box}$$

$$\mu \cdot M g \cos \theta \cdot \frac{8}{10} \cdot 10 \cdot 5 \cdot \frac{1}{2} = 20$$

$$30 \cdot x^2 = 60 + 20 \quad x = \sqrt{\frac{8}{3}}$$

Soru 21)



$$N_1 + T \cos \theta = M_1 g$$

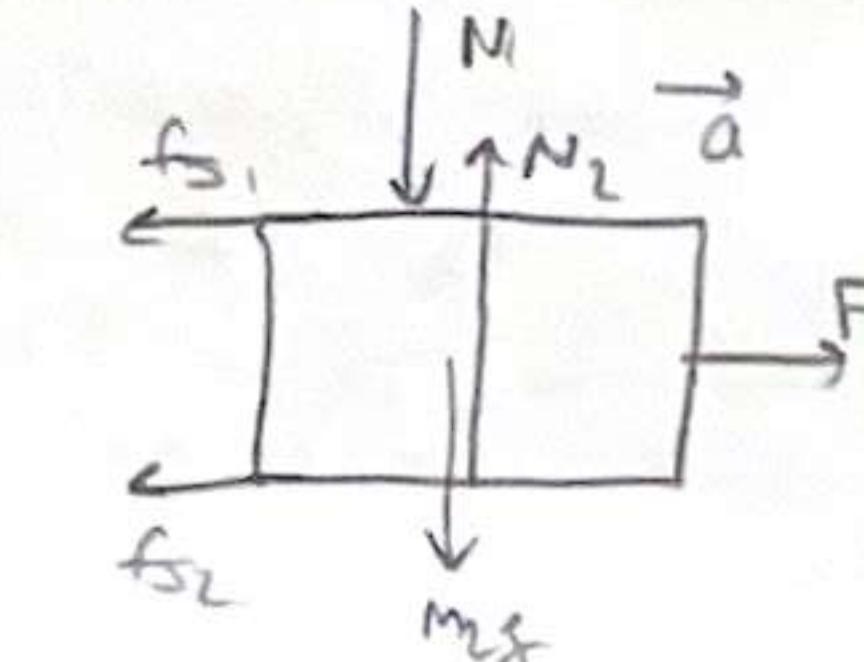
$$f_{s1} = \mu (M_1 g - T \cos \theta)$$

$$f_{s1} = T \sin \theta$$

$$\mu (M_1 g - T \cos \theta) = T \sin \theta$$

$$\mu M_1 g = T \mu \cos \theta + T \sin \theta$$

$$T = \frac{\mu M_1 g}{\mu \cos \theta + \sin \theta}$$



9)  $t=1$  tane  $\vec{a} \rightarrow \vec{a}_r$  bulunur.

$$\vec{a} = \vec{a}_T + \vec{a}_R$$

$$a^2 = (a_T)^2 + (a_R)^2$$

$$40 =$$

$$a_R = \frac{|\vec{F} \times \vec{d}|}{|\vec{d}|} \Rightarrow \frac{|(v_x \cdot a_y) - (v_y \cdot a_x)|}{|\vec{d}|} = 2\sqrt{2} = a_R$$

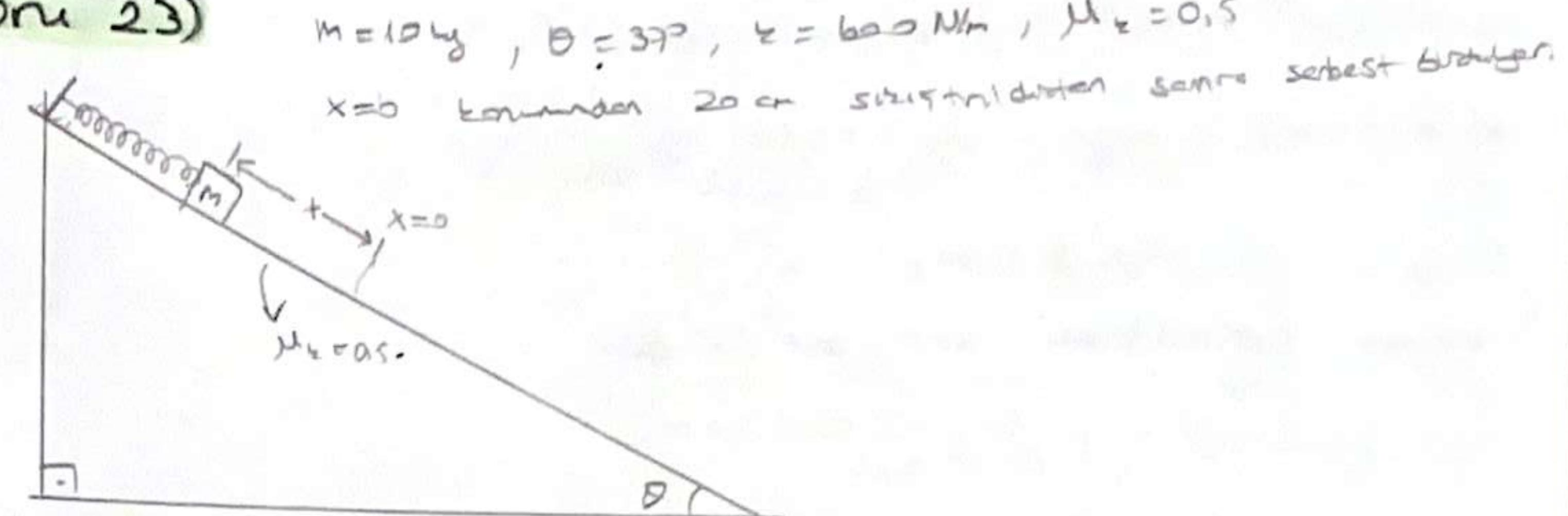
$$v_x = 3 \quad v_y = 3 \quad a_x = 6 \quad a_y = 2$$

$$\frac{|18 - 6|}{3\sqrt{2}} = \frac{12}{3\sqrt{2}} = \frac{4\sqrt{2}}{2} = 2\sqrt{2}$$

$$a^2 = (a_T)^2 + (a_R)^2$$

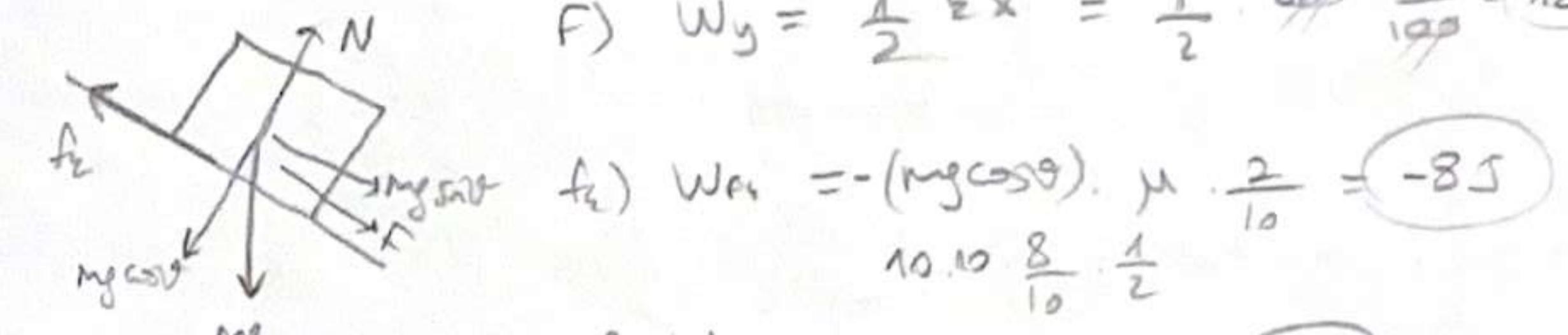
$$40 = (a_T)^2 + 8 \quad [4\sqrt{2} = a_T]$$

Soru 23)



a) Yer serbest bırakıldığında sonra yayan sisteminin konumuna 2 derece konum arasındaki cosme etkisi eden tıraklıklağının katsayıları hesaplanınız.

$$F = W_y = \frac{1}{2} \cdot z \cdot x^2 = \frac{1}{2} \cdot 10 \cdot \frac{4}{10} = 12 \text{ J}$$



$$f_k = -(mg \cos \theta) \cdot \mu \cdot \frac{2}{10} = -8 \text{ J}$$

$$W_{Ng} = mg \sin \theta \cdot \frac{2}{10} = 12 \text{ J}$$

b) Denge konumundan gecerek sonraki bulunuş.

$$W_{net} = \Delta E$$

$$16 = \frac{1}{2} \cdot 10 \cdot v_s^2 \quad \frac{16}{5} \Rightarrow \left[ \frac{4}{\sqrt{5}} = v_s \text{ (m/s)} \right]$$

Soru 24)  $\vec{F}$  parçası t=0'da sağda gösterilen koordinatlarla gecerek

$\vec{F} = (3t^2)\hat{i} + (2t+1)\hat{j}$  (N/s) olarak verilen zamanla boyutlu hizda  $x = 0$  düzleminde hareket etmektedir.

a)  $t=1$  s süren time aralığından bulun.

$$\vec{F} = (3t^2)\hat{i} + (2t+1)\hat{j} \Big|_{t=1} \quad \vec{F} = 3\hat{i} + 3\hat{j} \text{ (N/s)}$$

$$\vec{a} = (6t)\hat{i} + 2\hat{j} \Big|_{t=1} \quad \vec{a} = 6\hat{i} + 2\hat{j} \text{ (m/s}^2\text{)}$$

$$\int (3t^2)\hat{i} + (2t+1)\hat{j} dt = (t^3)\hat{i} + (t^2+t)\hat{j} \Big|_{t=1} \Rightarrow \vec{F} = (\hat{i} + 2\hat{j}) \text{ N}$$

b)  $t=1$  süren time aralığından ortalama açı bulunuş.

$$\frac{\vec{a} \cdot \vec{r}}{a_T} = \cos \theta \quad \cdot \frac{(6\hat{i} + 2\hat{j})(\hat{i} + 2\hat{j})}{2\sqrt{10} \cdot \sqrt{5}} = \frac{6+4}{2\sqrt{2} \cdot 5} = \frac{\sqrt{2}}{2} \quad \arccos\left(\frac{\sqrt{2}}{2}\right) = 45^\circ$$

$$\theta = 45^\circ$$