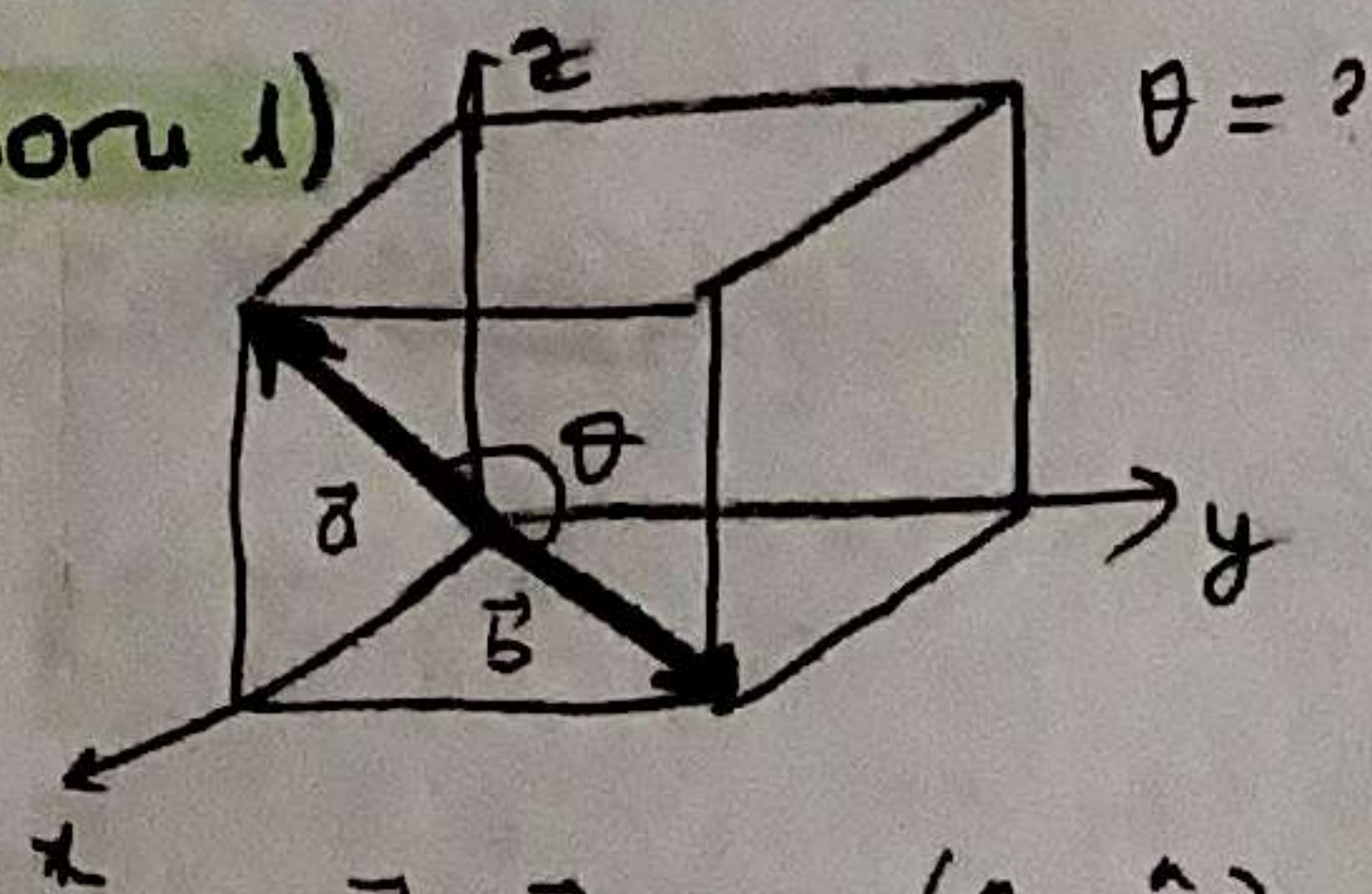


# Sinava Hazırlık

Soru 1)



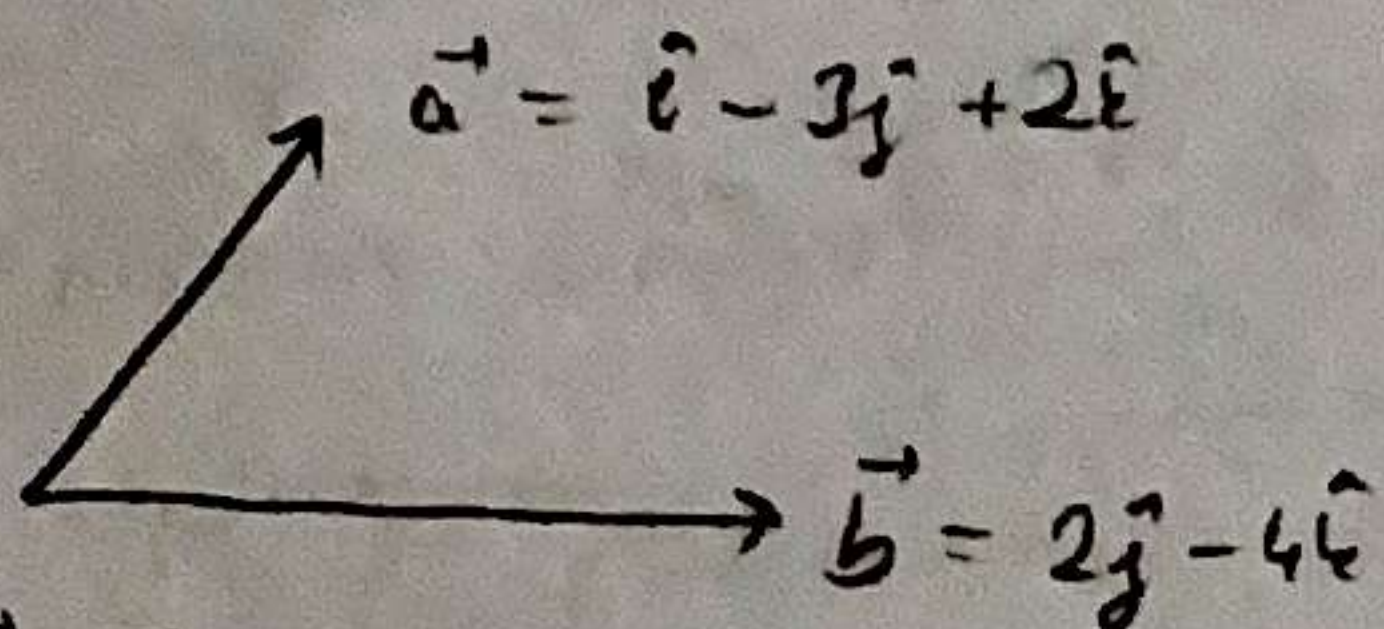
$\theta = ?$

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

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

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  $\vec{b}$  vektörleri bir paralelkenar kenarları ise alan = ?



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

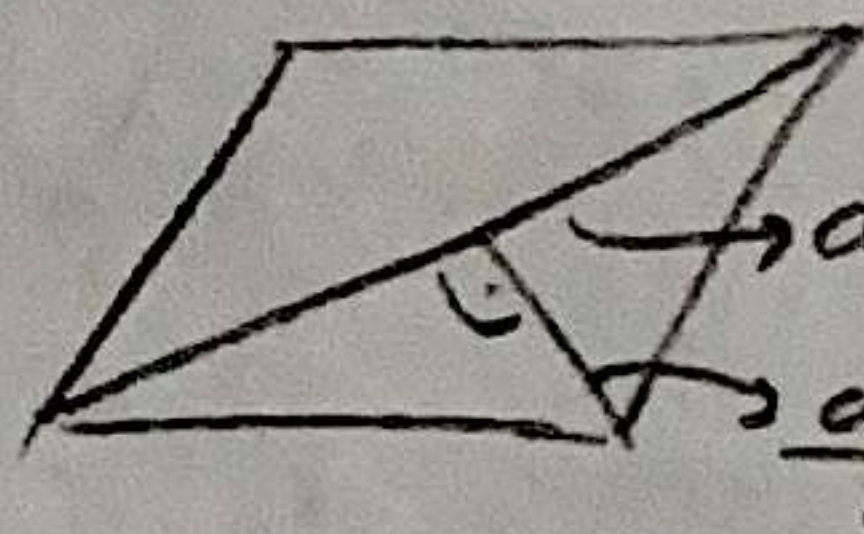
$$\vec{b} = 2\hat{j} - 4\hat{k}$$

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

$$\sqrt{1 + 25 + 36} = \sqrt{62}$$

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

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



$$\frac{(a+b)(a-b)}{2}$$

$$\frac{2\sqrt{2} \cdot \sqrt{3} \cdot \sqrt{2} \cdot \sqrt{3}}{2} = 2\sqrt{21}$$

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

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

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

b) Hem  $\vec{a}$  hem de  $\vec{b}$  vektörüne dik olan birim vektör bulunur

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

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



**Soru 5)**  $t=0$  anında  $U_0$  ile hızla sahne bir orkestra doğrusal bir yol boyunca hareket etmektedir.  $a = \frac{-k}{2v}$  ile verilen bir yavaşlama ivmesi sahiptir. ( $k$  sabit,  $v$  her hangi bir anlık hız)

a) Zamanla bağlı hız denklemini yazınız

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

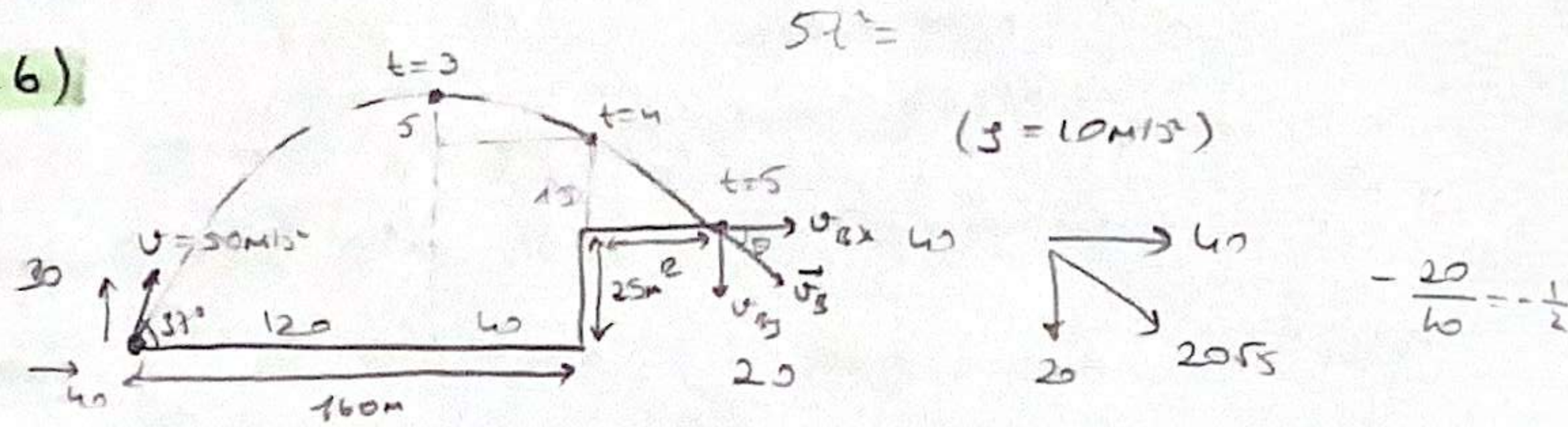
$$\int_{U_0}^v 2v \cdot dv = \int_0^t -k \cdot dt$$

$$v^2 - U_0^2 = -kt \Rightarrow v = \sqrt{U_0^2 - kt}$$

b) Arabanın durması için ne kadar süre gerekir?

$$v = \sqrt{U_0^2 - kt} = 0 \Rightarrow t = \frac{U_0^2}{k}$$

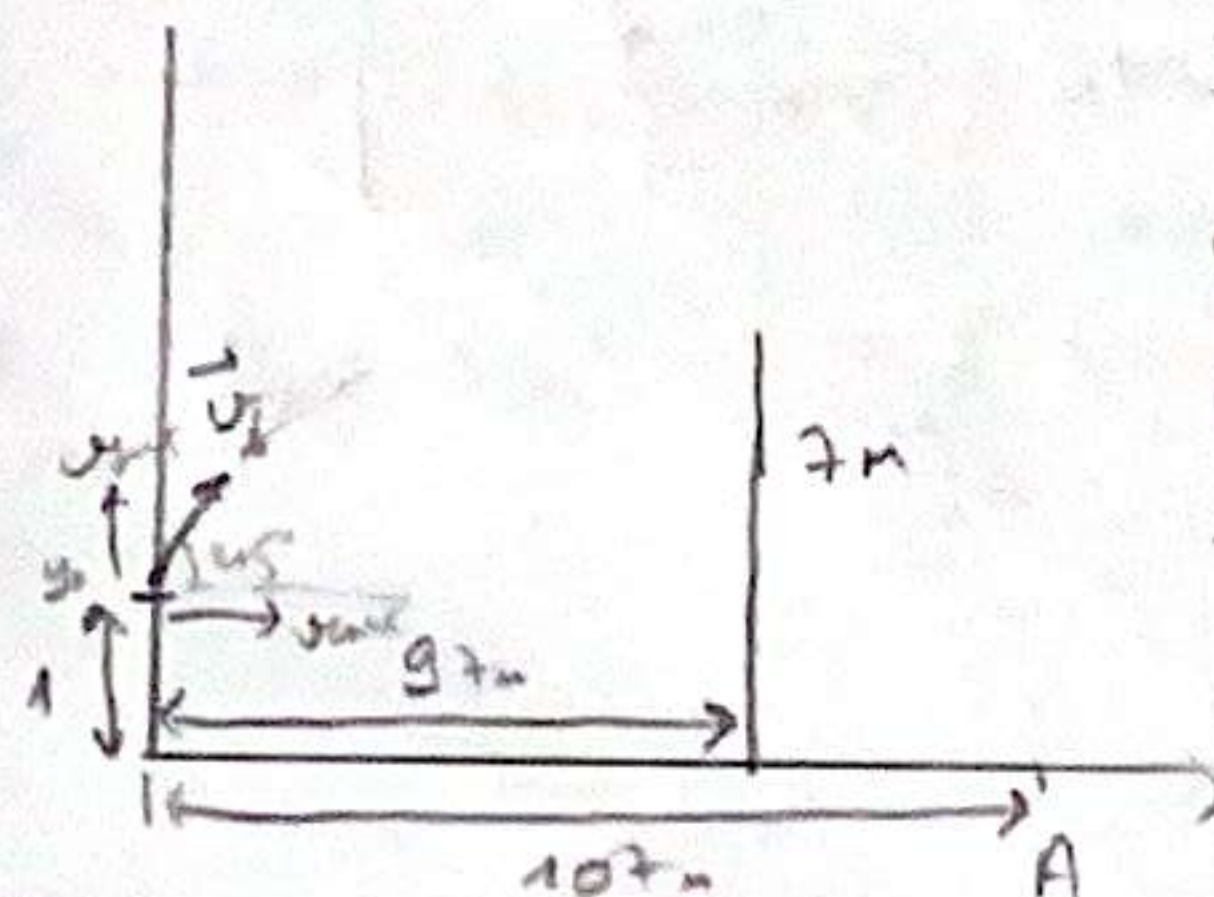
**Soru 6)**



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

b)  $\theta = ?$   $|\vec{v}_B| = ?$   $\theta = \arctan(-\frac{1}{2})$   $v_B = 20 \text{ m/s}$

**Soru 7)** Top perpendiküler asabilir mi?  $107 \text{ m} = A + 5 \text{ m}$  uzeri



$$y = y_0 + v_{y0} \cdot t - \frac{1}{2} a t^2$$

$$0 = 1 + v_{y0} \cdot t - \frac{1}{2} \cdot 10 \cdot t^2$$

$$0 = 1 + v_{y0} \cdot 1.07 - 5 \cdot (1.07)^2$$

$$v_{y0} = (32.6) \text{ (m/s)} \cdot t = 4.21 \text{ s}$$

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

$$y_1 = 9.8 \text{ m} \quad 9.8 > 7 \quad \checkmark$$

$$x = v_{x0} \cdot t$$

$$10.7 = v_{x0} \cdot 1.07 \cdot t$$

$$v_{x0} = 32.6 \text{ m/s}$$

$$t_{u} = 4.16 \text{ s}$$

**Soru 3)**  $x-y$  düzleminde sabit hızla hareket eden bir parçacık  $t=0$  anında orijindedir, hızı da  $\vec{v}_i = (4\hat{i} - 3\hat{j}) \text{ m/s}$  'dir. 4s sonra konumu  $\vec{r}_3 = (6\hat{i} + 8\hat{j}) \text{ m}$  olduğuna göre hız ve hız vektörlerini bulunuz.

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

$$\vec{r}_3 = \vec{r}_i + \vec{v}_i t + \frac{1}{2} \vec{a} t^2$$

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

$$\vec{v}_3 = \vec{v}_i + \vec{a} t$$

$$\vec{v}_3 = (4\hat{i} - 3\hat{j}) + \left(\frac{-5\hat{i}}{4} + \frac{5\hat{j}}{2}\right) \cdot 4 \Rightarrow \vec{v}_3 = -\hat{i} + 7\hat{j} \text{ m/s}$$

**Soru 4)**  $x$  ekseninde  $U_0$  ile hızla hareket eden bir parçacığın ivmesi  $a = -2 + 3t$  'dir.  $t$  zaman,  $a$  ise  $\text{m/s}^2$  'dir. Parçacığın  $t=4$  s anındaki  $x$  koordinatının değerini  $t=0$  anındaki değere eşit olabilmesi için  $U_0$  ne olmalıdır?

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

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

$$\int_{U_0}^v dv = \int_0^t (-2 + 3t) dt \Rightarrow v - U_0 = -2t + \frac{3t^2}{2}$$

$$v = U_0 - 2t + \frac{3t^2}{2}$$

$$v = \frac{dx}{dt} \quad dx = (U_0 - 2t + \frac{3t^2}{2}) \cdot dt$$

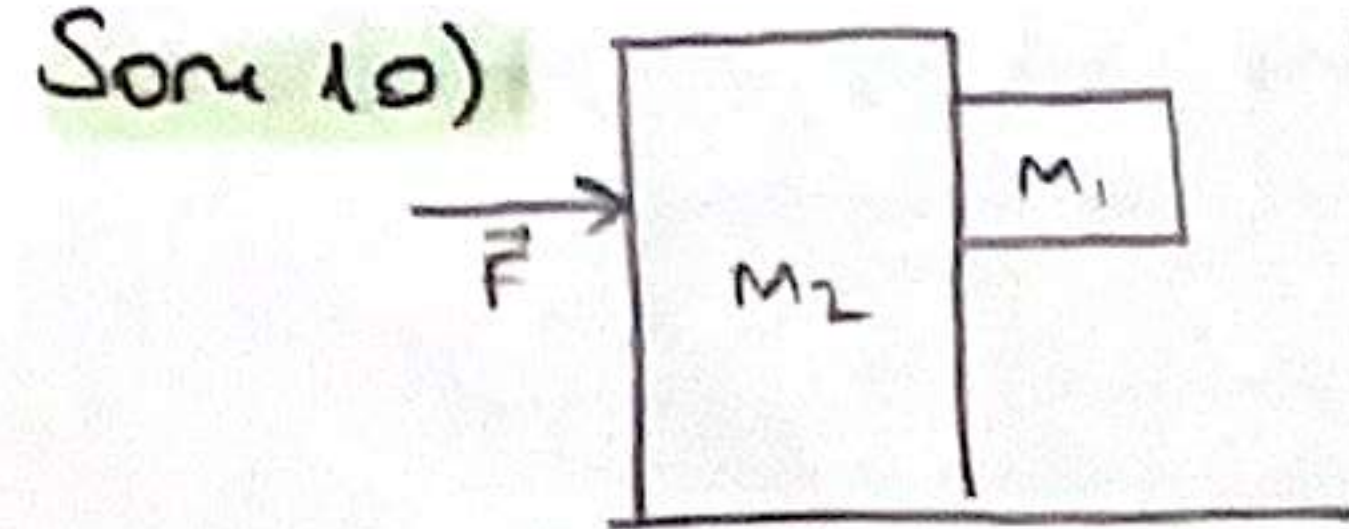
$$\int_{x_0}^x dx = \int_0^t (U_0 - 2t + \frac{3t^2}{2}) dt \Rightarrow x - x_0 = U_0 t - t^2 + \frac{t^3}{2}$$

$$(x = x_0)$$

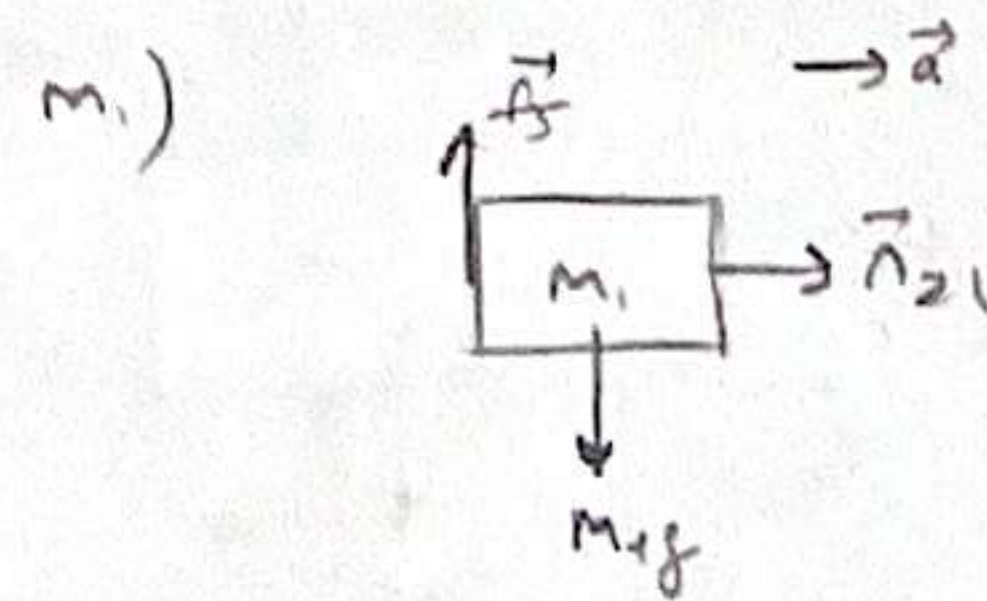
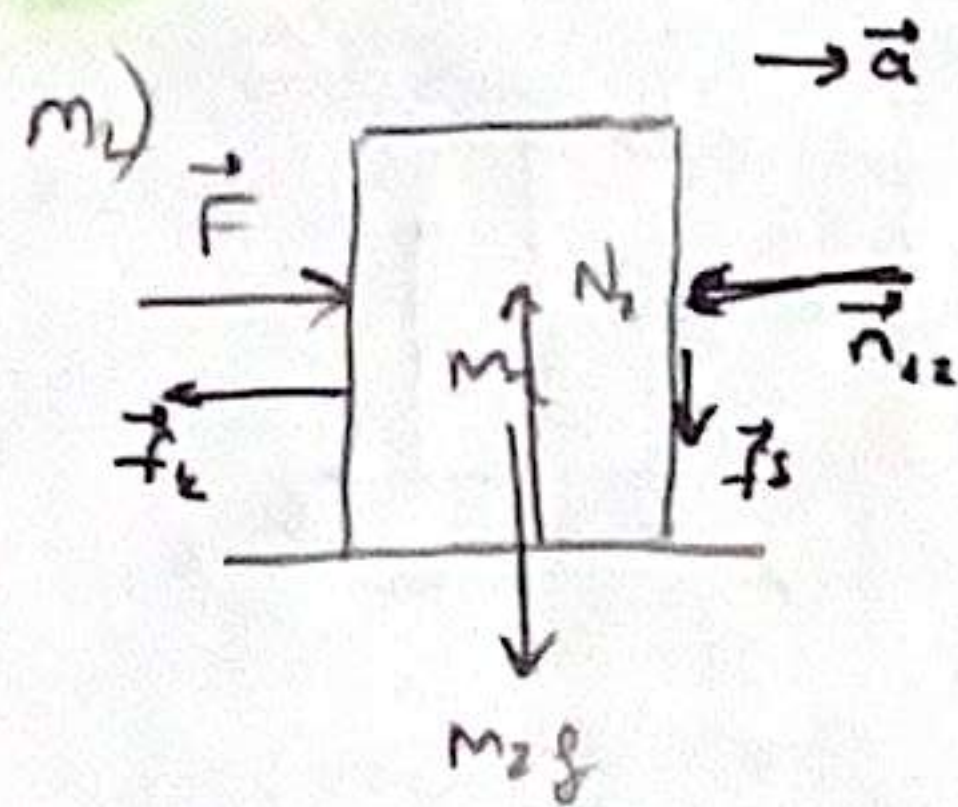
$$0 = 4U_0 - 16 + 32$$

$$U_0 = -4 \text{ m/s}$$





a) Serbest cisim diyagramı



b) Newton hareket denklemleri

m<sub>2</sub>)  $F - n_{21} - f_k = m_2 a$

$N_1 = f_s + m_2 g$

$N_1 = (m_1 + m_2) g$

m<sub>1</sub>)  $n_{21} = m_1 a$  ( $n_{12} = n_{21} = m_1 a$ )

$f_s = m_1 g$

c) m<sub>1</sub>'in dışına doğru iten m<sub>2</sub> için gereken m<sub>2</sub> için  $\vec{F}$  nedir?

m<sub>1</sub> kütlesinin kayma anında  $f_s \text{ max}$  ve  $F = F_{\text{min}}$  olur

$f_s = m_1 g$   $n_{21} = n_{12} = m_1 a$

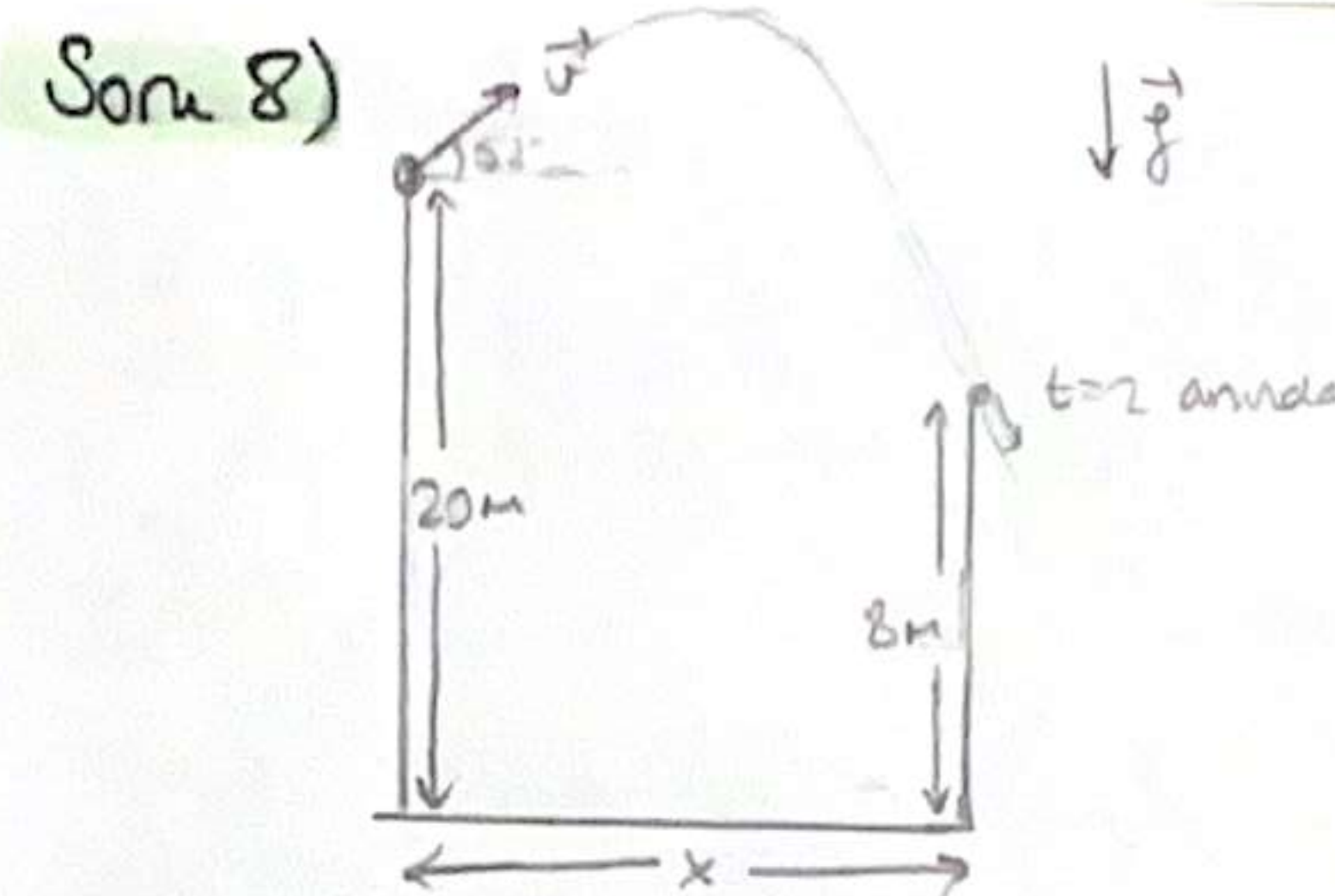
$N_1 = (m_1 + m_2) g$

$f_{s \text{ max}} = \mu_s n_{21} = \mu_s m_1 a = m_1 g \Rightarrow a = \frac{g}{\mu_s}$

$f_k = \mu_k \cdot N_1 = \mu_k (m_1 + m_2) g$

$F_{\text{min}} - m_1 a - \mu_k (m_1 + m_2) g = m_2 a$   $F_{\text{min}} = \mu_k (m_1 + m_2) g + a(m_1 + m_2)$

$F_{\text{min}} = \mu_k g (m_1 + m_2) + \frac{g}{\mu_s} (m_1 + m_2) \Rightarrow F_{\text{min}} = g (m_1 + m_2) \cdot \left( \mu_k + \frac{1}{\mu_s} \right)$



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

$8 = 20 + 9(0.8) \cdot 2 - 5 \cdot 4$

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

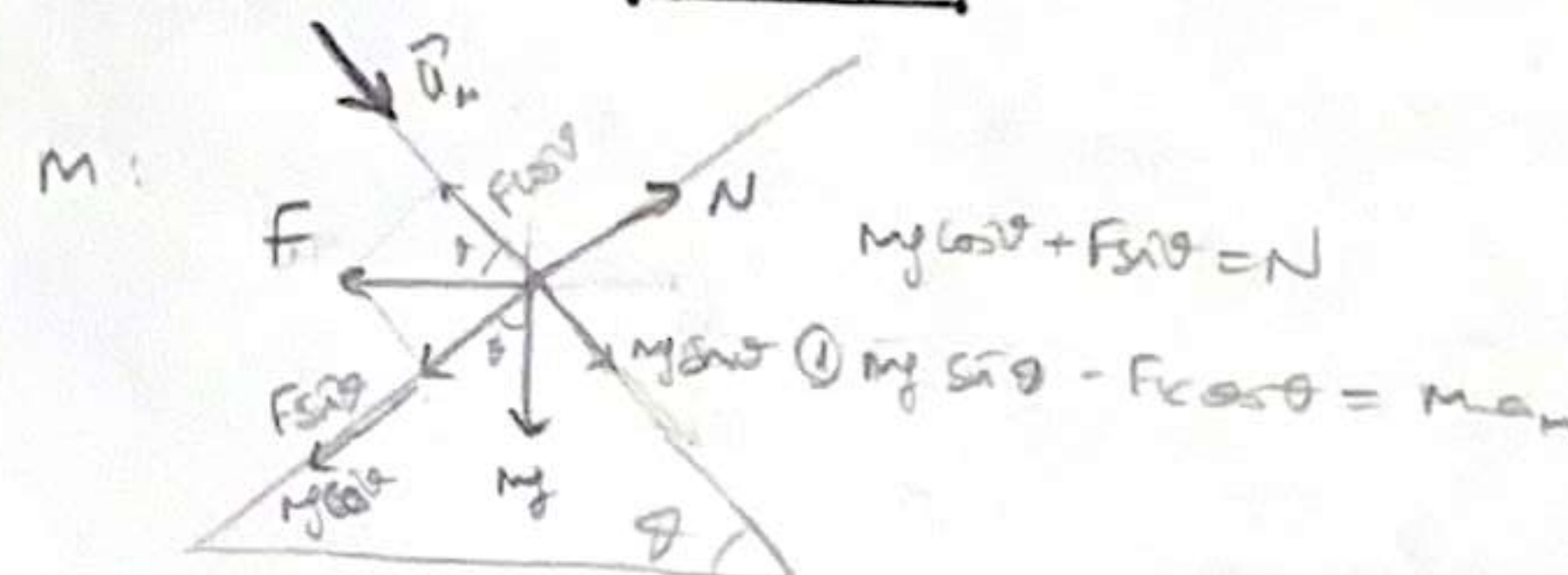
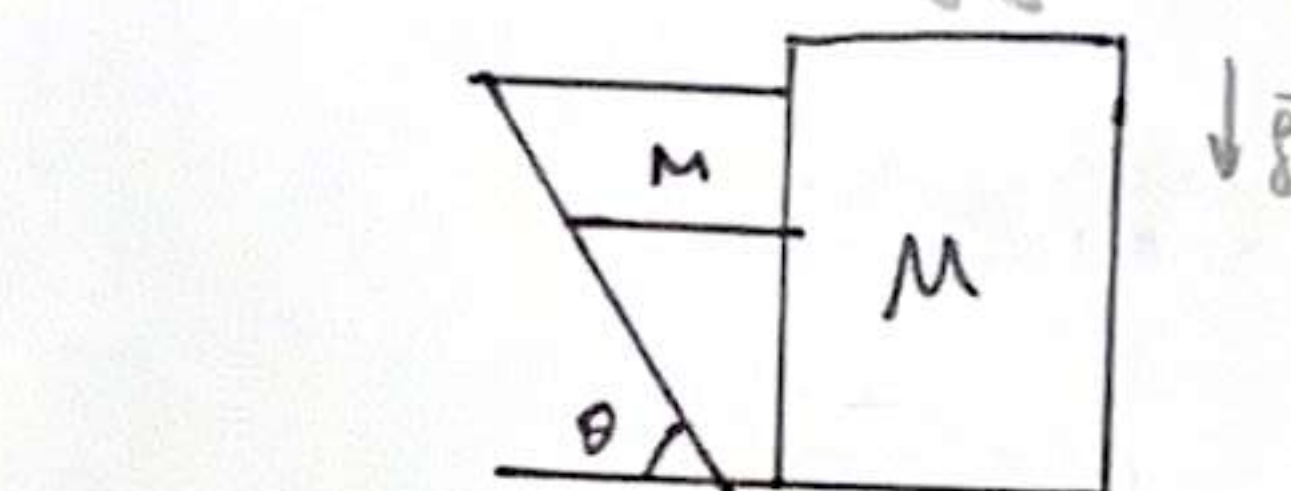
b)  $x = ?$

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

$x = 5 \cdot (0.6) \cdot 2$   $\boxed{x = 6 \text{ m}}$

Soru 9) m kütlesi blok serbest bırakıldığında, M kütlesi blok sağa doğru iterek aşağı doğru hareket başlıyor.

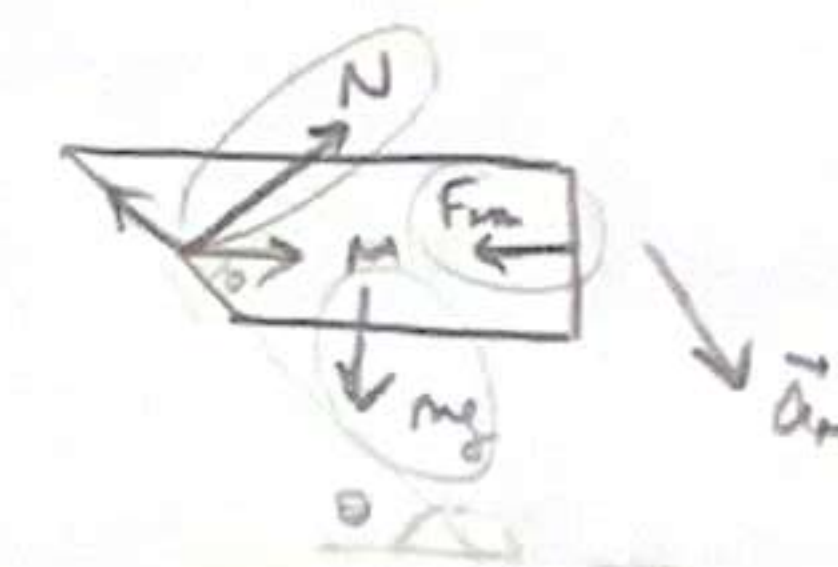
a) Serbest cisim diyagramı çiziniz



$a_M$   $\vec{a}_M = \vec{a}_n \cdot \cos \theta$

1)  $m g \sin \theta - (M a_M) \cdot \cos \theta = m a_M$

$m g \sin \theta - M (a_M \cdot \cos \theta) \cdot \cos \theta = m \cdot a_M$



M:  $N = m g$   
 $F = M a_M$   
 $\frac{F}{M} = a_M$

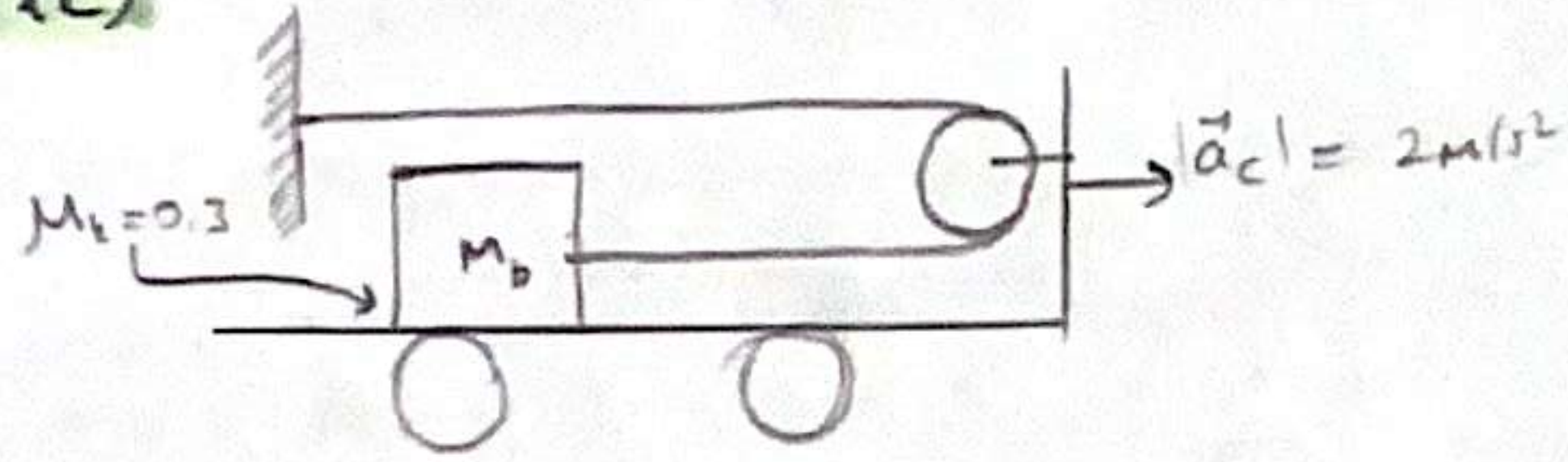
$\frac{m g \sin \theta}{M \cos \theta + m} = a_M$  ( $M \cos^2 \theta + m$ )

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

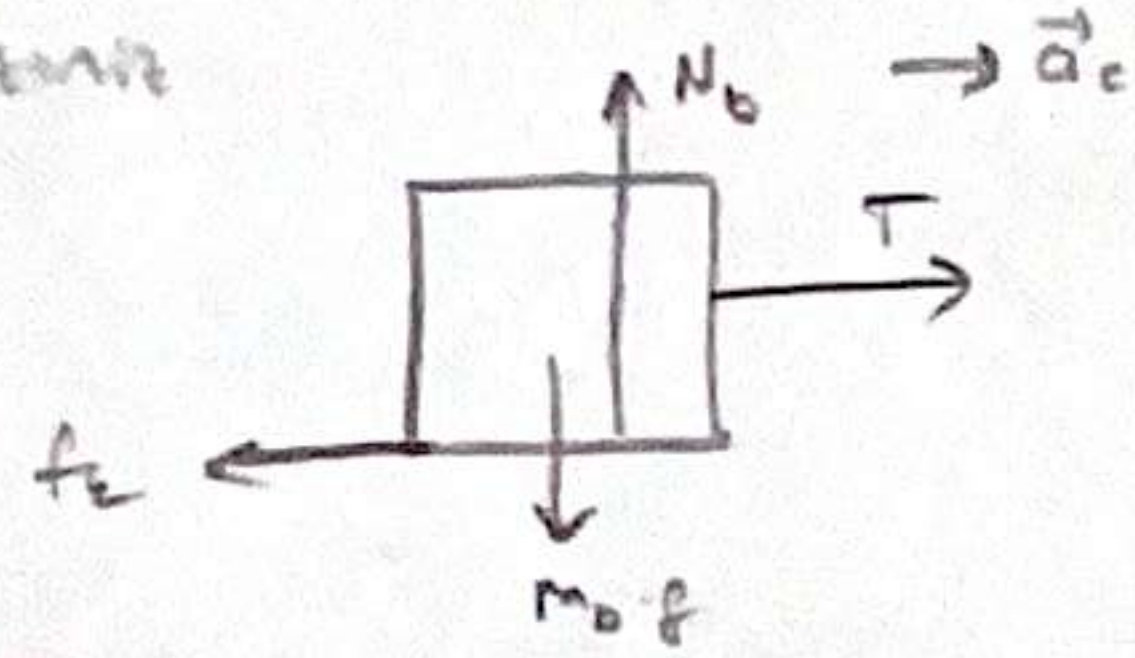


Soru 12)

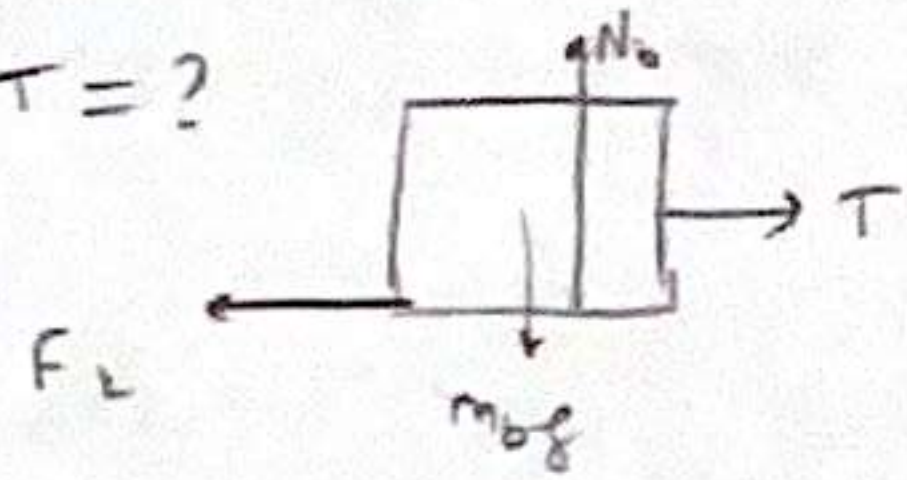
$$M_b = 50 \text{ kg}$$



a) Yordaklar dıŖın g r nt ye g re k t n serbest cisim diyagramını  r nt 



b) T = ?

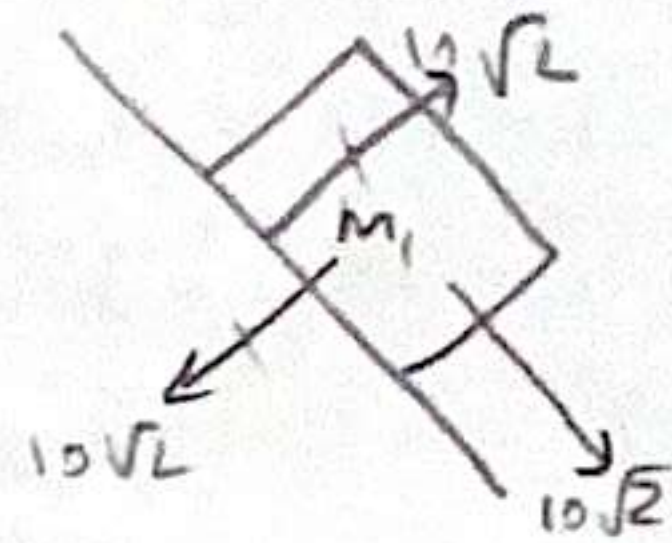
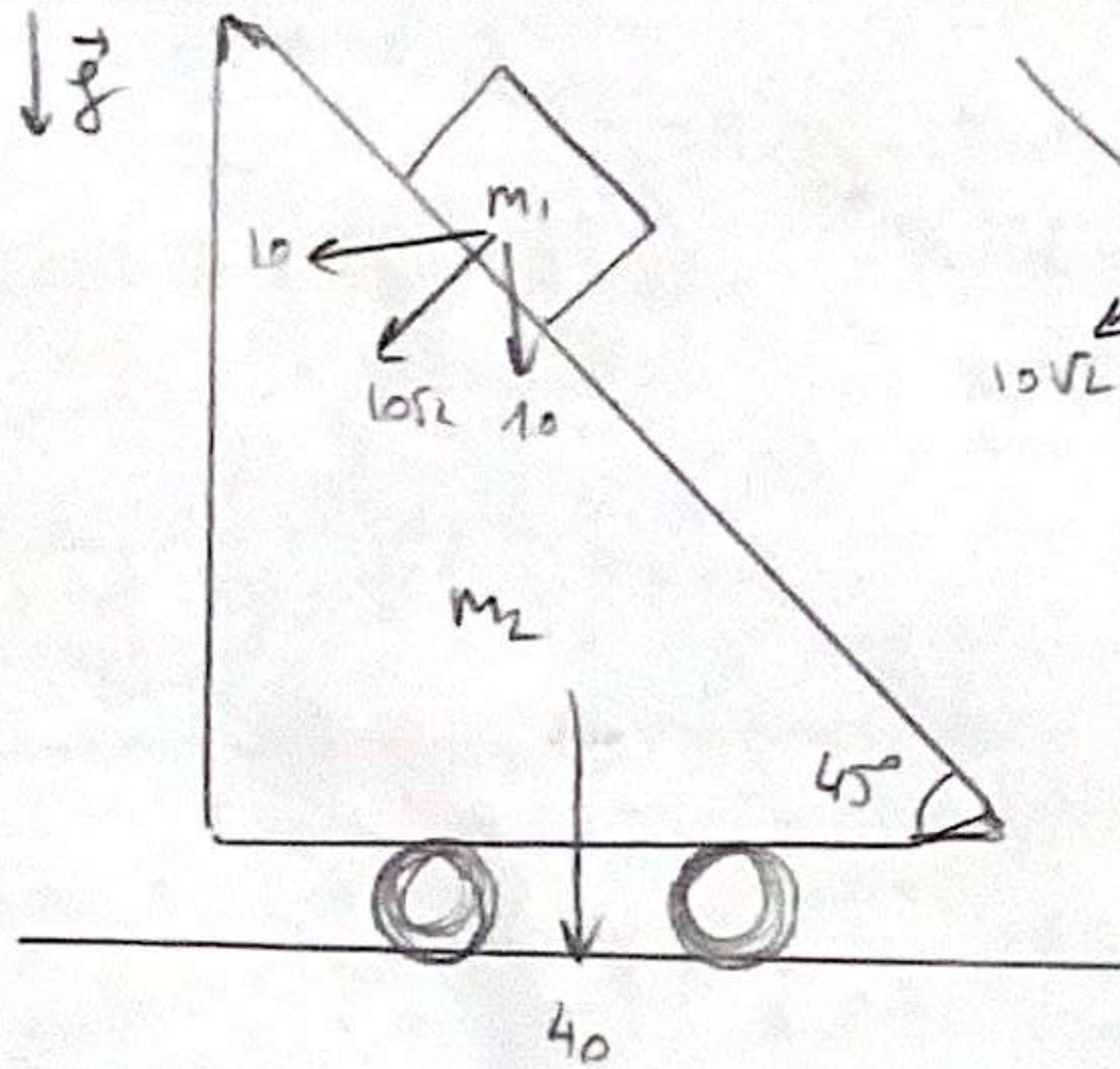


$$50 \cdot 10 \cdot \frac{3}{10} = 150 \text{ N}$$

$$T - 150 = 50 \cdot 2 \Rightarrow T = 350 \text{ N}$$

Soru 13)  $m_1 = 2 \text{ kg}$   f n d lende a   f  d f n kaymakla ve  $m_2 = 4 \text{ kg}$   f  d f n sola d f n         .

a) B f n  f  d f ne g re          n   ?



$$10\sqrt{2} = 2 \cdot a_1$$

$$5\sqrt{2} = a_1$$

$$a_1 = (5\hat{i} - 5\hat{j}) \text{ m/s}^2$$

$$10 = 4 \cdot a_2$$

$$2.5 = a_2$$

$$a_{\text{g r}} = (2.5\hat{i} - 5\hat{j}) \text{ m/s}^2$$

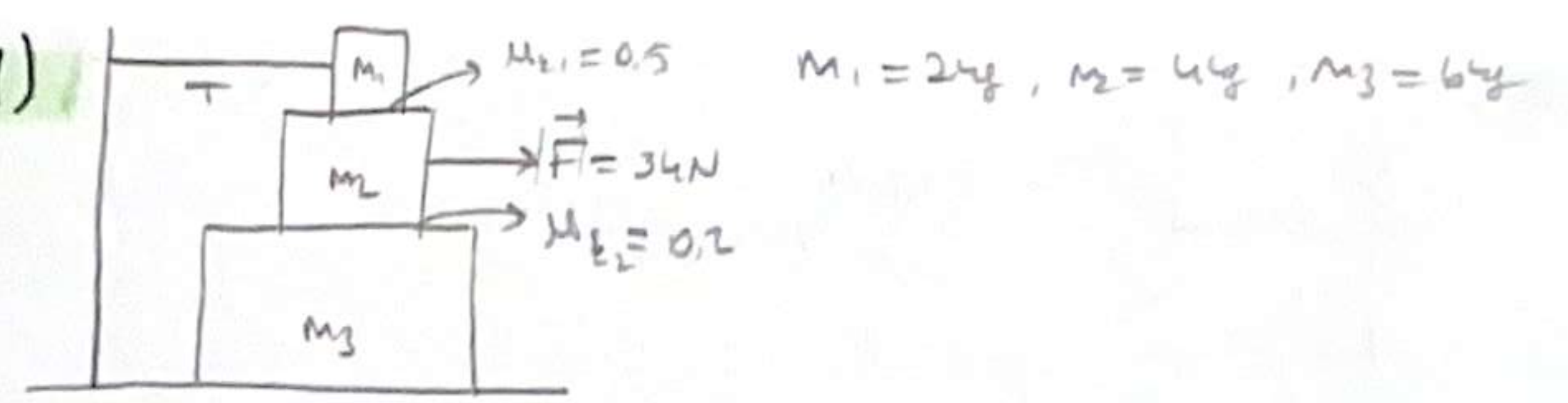
b) B f n g r  g r           n   ?

$$10 = 4 \cdot a_2 \quad 2.5 = a_2 \quad a_{\text{g r}} = (2.5\hat{i} - 5\hat{j}) \text{ m/s}^2$$

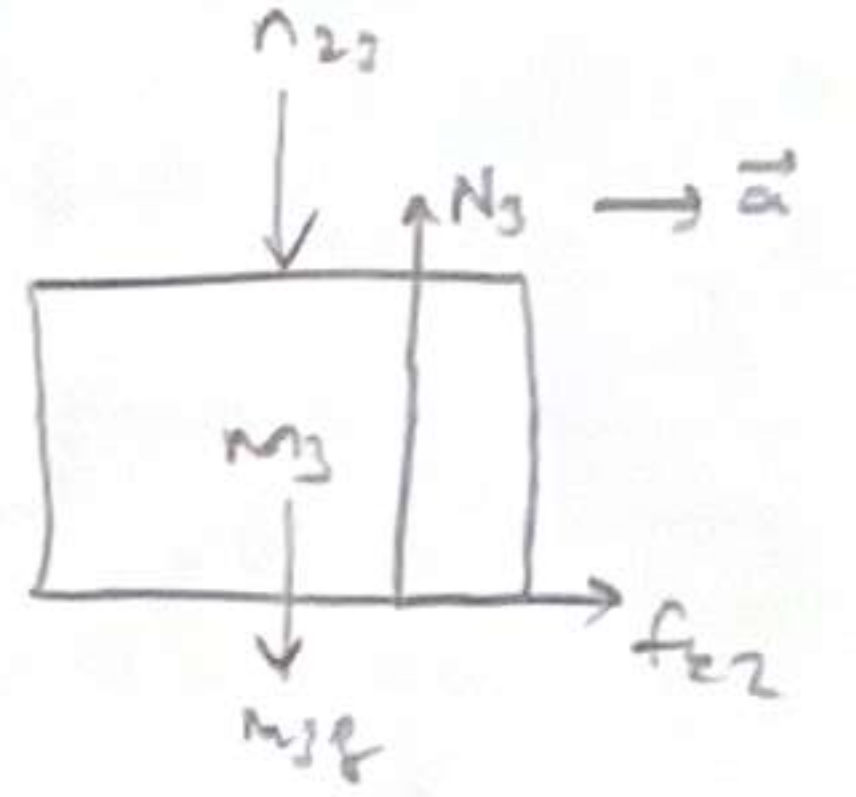
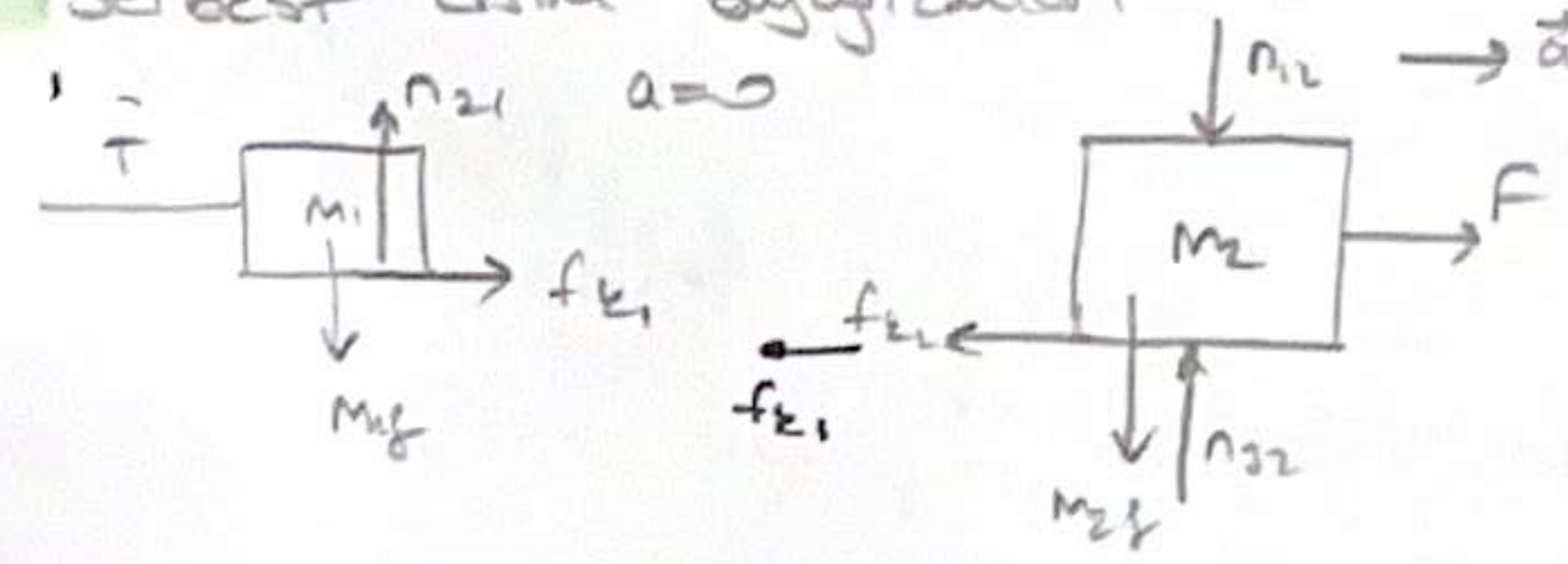
$$(5 - 2.5)\hat{i}$$

$$2.5 \rightarrow 5$$

Soru 11)



a) Serbest cisim diyagramları



b) T = ? , a2 = ? , a3 = ?

$$n21 = m1 \cdot g \quad n21 = n12 = m1 \cdot g = 20$$

$$f_k1 = T \quad m1 \cdot \mu_k1 = 2 \cdot 10 \cdot \frac{5}{10} \Rightarrow 10 \quad T = 10 \text{ N}$$

$$34 - f_k1 - f_k2 = m2 \cdot a2 \quad f_k2 = (n12 + m2 \cdot g) \cdot \mu_k2$$

$$(20 + 40) \cdot \frac{2}{10} \quad f_k2 = 12$$

$$34 - 10 - 12 = 4 \cdot a2$$

$$a2 = 3 \text{ m/s}^2$$

$$f_k2 = m3 \cdot a3 \quad 12 = 6 \cdot a3 \quad a3 = 2 \text{ m/s}^2$$

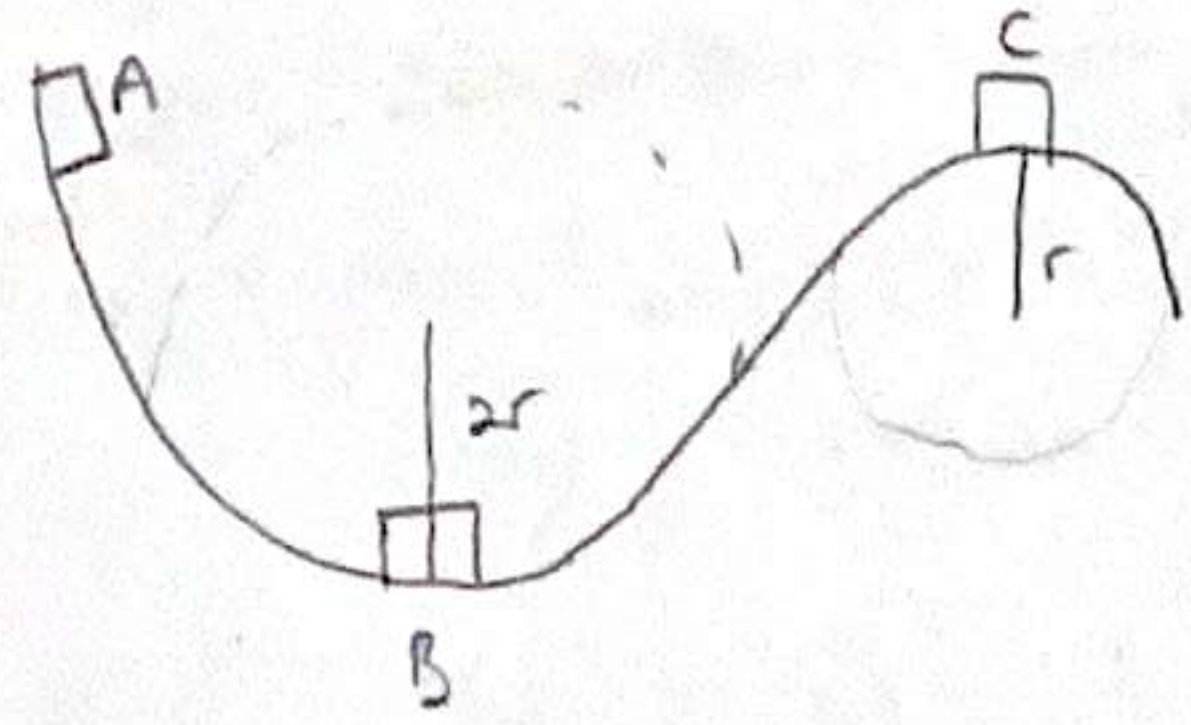
13) a) Blok  f n d lende 3 m) yol aldıŖna g re  f n d f n ka  metre yol aldı?

$$3 = 0 + 0 \cdot t + \frac{1}{2} \cdot 5\sqrt{2} \cdot t^2 \quad t^2 = \frac{3\sqrt{2}}{5} \quad t = \sqrt{\frac{3\sqrt{2}}{5}}$$

$$\Delta x_{\text{g r}} = 0 + 0 \cdot t + \frac{1}{2} \cdot \frac{5}{2} \cdot \frac{3\sqrt{2}}{5} \Rightarrow \Delta x_{\text{g r}} = \frac{3\sqrt{2}}{4} \text{ (m)}$$



Soru 16) Sırtlanma hızı  $v_0$  ile yarıçap  $r$  olan A noktasından bir cisim serbest bırakılır. TCPE kütlesi B noktasında ağırlığın 2 katı kadar. C noktasında ise ağırlığın yarısı kadardır.  $\frac{v_B}{v_C} = ?$



$$B) F_B = \frac{mv_B^2}{r} = N_B - mg$$

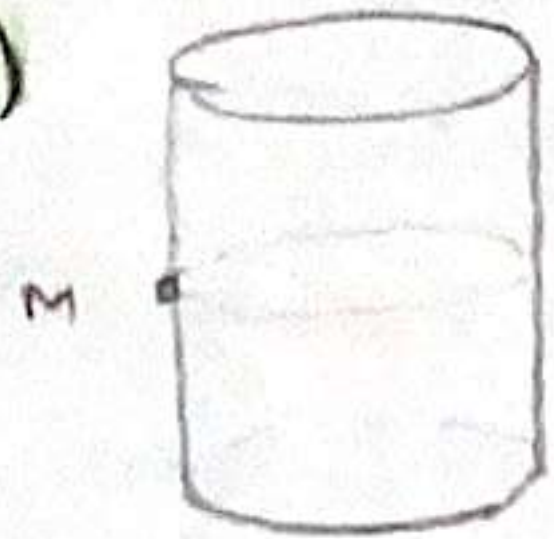
$$\frac{mv_B^2}{r} = \frac{2mg}{2} \quad \boxed{v_B^2 = 2gr}$$

$$C) F_C = \frac{mv_C^2}{r} = mg - \frac{mg}{2}$$

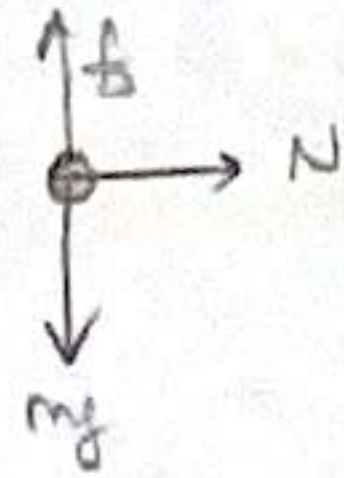
$$\frac{mv_C^2}{r} = \frac{mg}{2} \quad \boxed{v_C^2 = \frac{gr}{2}}$$

$$\frac{v_B}{v_C} = \sqrt{\frac{2gr}{\frac{gr}{2}}} = 2$$

Soru 17)



Yarıçapı 5m olan bir silindirin  $\omega$  hızında döndürülen bir motorun silindirin dairesel hareketi yapabileceği minimum hızı bulunuz ( $g = 10$ )



$$N = m \cdot \frac{v^2}{r} \quad F_c = mg \quad F_c = \frac{mv^2}{r} \cdot 0.5$$

$$\frac{mv^2}{5} = \frac{mg}{2} \quad \boxed{v = 10 \text{ m/s}}$$

Soru 18)  $v_x = (5-3t) \text{ (m/s)}$   $v_y = (-8t+3t^2) \text{ (m/s)}$  t=0'da başlar,  $M=2\text{kg}$

t=0 anında orijindedir.

a) Herhangi bir an için konum vektörü

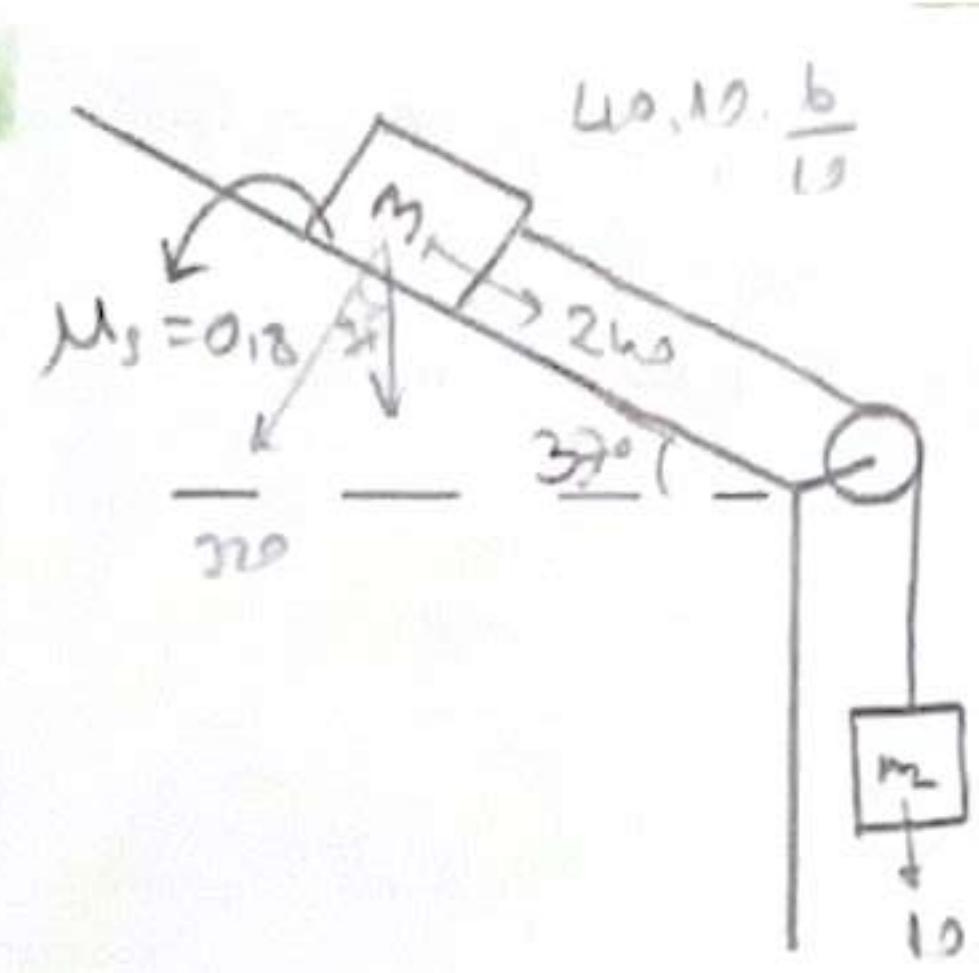
$$\int (5-3t) dt + \int (-8t+3t^2) dt = [(5t-1.5t^2)\hat{i} + (-4t^2+t^3)\hat{j}] \text{ (m)}$$

b) t=4 sn'de orijine ne kadar uzakta?

$$\frac{\Delta \vec{r}}{\Delta t} = \frac{[(5t-1.5t^2)\hat{i} + (-4t^2+t^3)\hat{j}]|_{t=4} - [(5t-1.5t^2)\hat{i} + (-4t^2+t^3)\hat{j}]|_{t=0}}{4-0}$$

$$\frac{-44\hat{i}}{4} \Rightarrow -11\hat{i} \text{ (m/s)}$$

Soru 14)



$$m_1 = 40\text{kg}, m_2 = 10\text{kg}$$

a)  $m_1$  kütlesinin etki eden statik sürtünme kütlesi nedir?

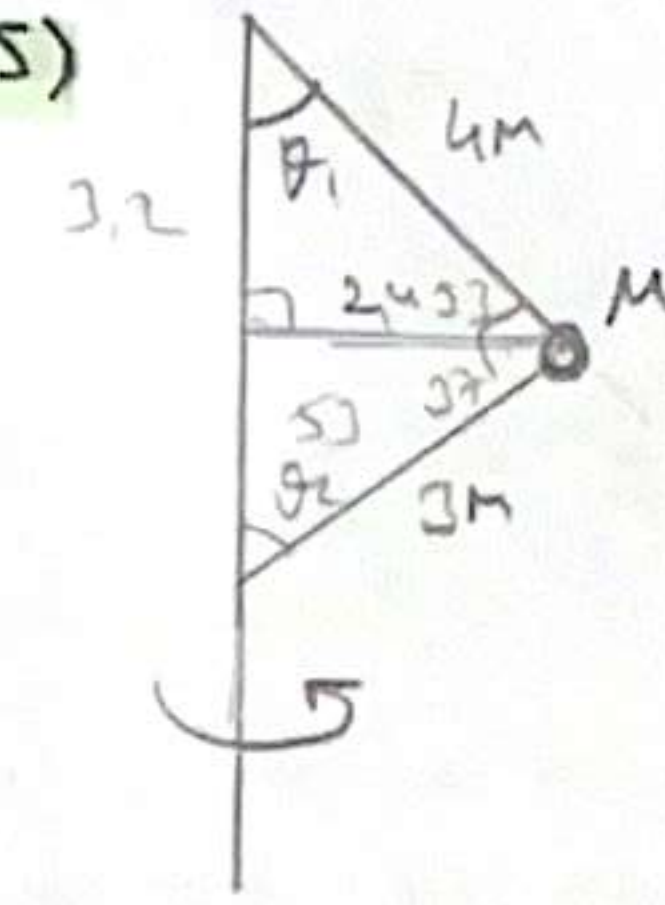
$$f_s = 320 \cdot \frac{8}{10} = 256 \text{ N (max)}$$

$$240 + 10 = 250 \text{ N} = f_s$$

b) Hareketi başlatmak için  $m_2$  kütlesi ne kadardır?

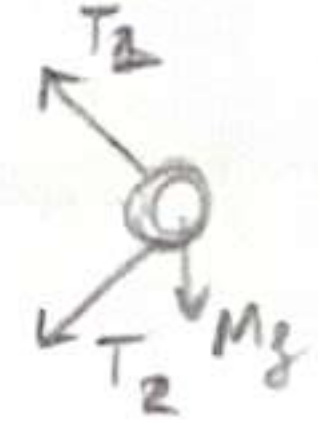
$$256 = 240 + m_2 \cdot 10 \quad \boxed{m_2 = 1.6}$$

Soru 15)

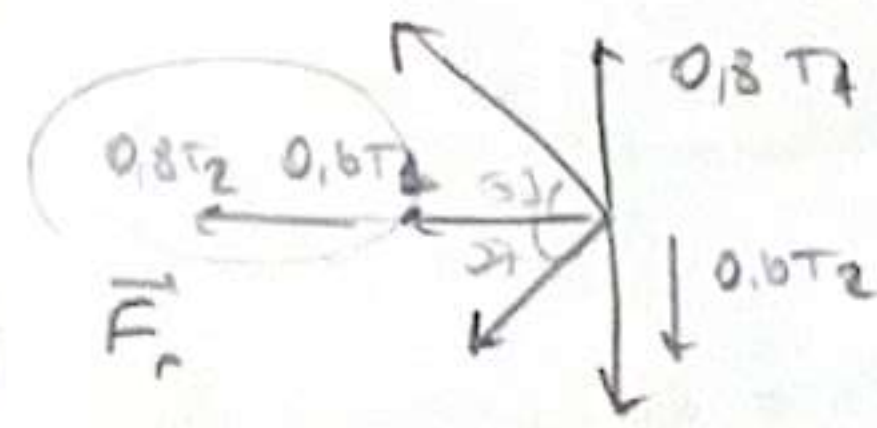


Cisim tam bir atmosfer 1.25 süzülür.

a) Serbest cisim diyagramını çiziniz.



b) İplerin gerilme kuvveti M cinsinden bulunuz



$$0.8T_1 = 0.6T_2 + mg$$

$$4T_1 = 3T_2 + 50M$$

$$4T_2 + 3T_1 = 5 \cdot M \cdot \frac{12 \cdot 12}{24} \cdot 1.25$$

$$3/4T_2 + 3T_1 = 300M$$

$$4/4T_1 - 3T_2 = 50M$$

$$v = \frac{2\pi r}{T} = \frac{2 \cdot 3 \cdot (12^2)}{12}$$

$$v = 12$$

$$12T_2 + 9T_1 = 900M$$

$$16T_1 - 12T_2 = 200M$$

$$25T_1 = 1100M$$

$$\boxed{T_1 = 44M} \quad \boxed{T_2 = 42M}$$

18) c) t=1 anında teğetzel ve radyal hızlarını bulunuz

$$\vec{a}_T = \frac{d\vec{v}}{dt} = \frac{[(5-3t)\hat{i} + (-8t+3t^2)\hat{j}]}{dt} = [-3\hat{i} + (-8+6t)\hat{j}] \text{ (m/s}^2\text{)}$$

$$\vec{a}_r = \frac{|\vec{v} \times \vec{a}_T|}{|\vec{v}|} \Rightarrow \frac{|(v_x \cdot a_{Ty}) - (v_y \cdot a_{Tx})|}{|\vec{v}|} = \frac{|(-3) \cdot (-2) - (-5) \cdot (-8)|}{\sqrt{34}} = \frac{34}{\sqrt{34}} = \sqrt{34}$$

d) t=1 anında hareketin yönü nedir?

$$\frac{F \cdot x}{t} = F \cdot v = m \cdot a \cdot v \Rightarrow 2 \cdot 34 = 68 \text{ Watt}$$



M2 hareketi hareket ettirilecek minimum F kuvveti bulunur

$$N_1 + T \cos \theta = m_1 g \quad f_1 = T \sin \theta \quad (1) \quad (m_1 g - T \cos \theta) \mu = T \sin \theta$$

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

→ kayma başladığında a=0 olur (F=f<sub>s</sub>)

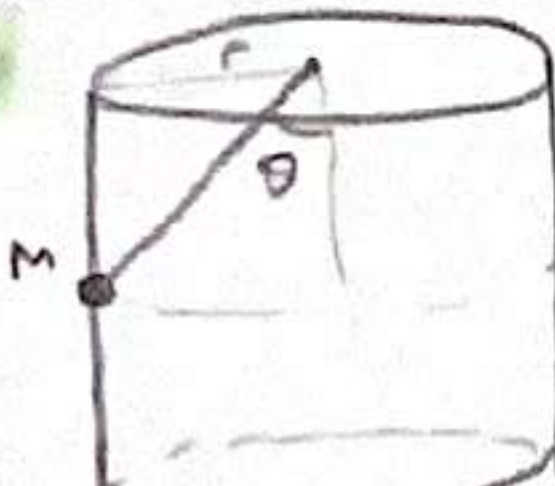
$$F_{\text{net}} = \frac{f_{s1}}{T \sin \theta} + \mu [(m_1 g - T \cos \theta) + m_2 g]$$

$$\mu m_1 g - T \cos \theta \cdot \mu + \mu m_2 g - T \cos \theta \cdot \mu + m_2 g \mu$$

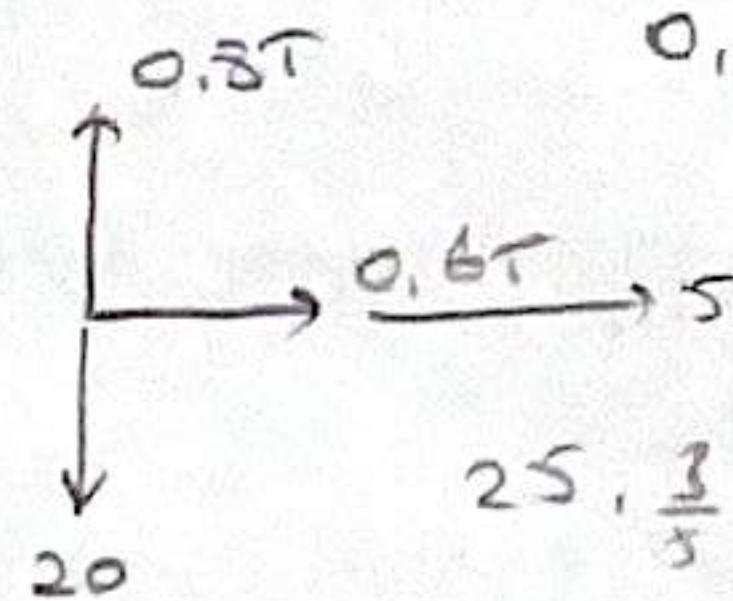
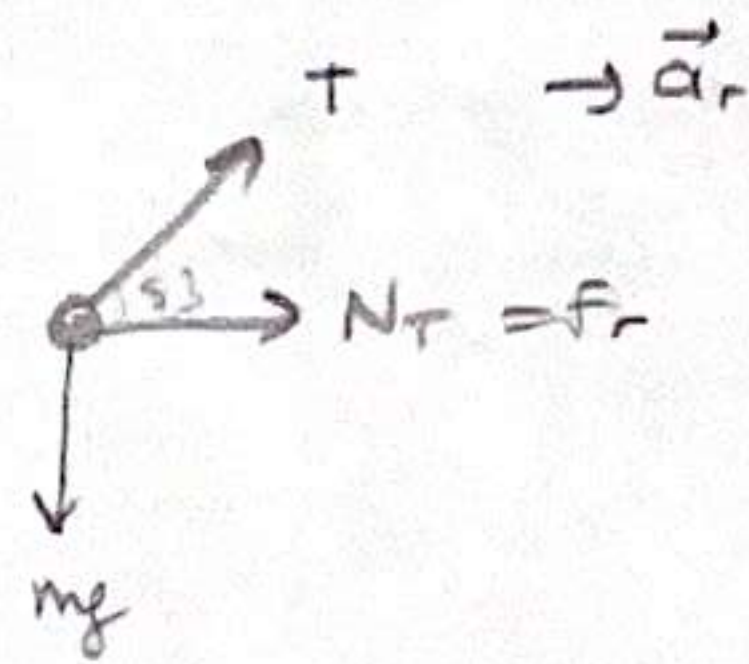
$$F_{\text{net}} = \mu g (2m_1 + m_2) - 2 T \cos \theta \cdot \mu$$

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

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

Soru 22)   $r=1\text{m}, m=2\text{kg}, \theta=37^\circ$ , alevin alevine uylg-ladyl  
tepe kullu SN, (Damsel hareket yapar)

a) Serbest cisim diyagramı



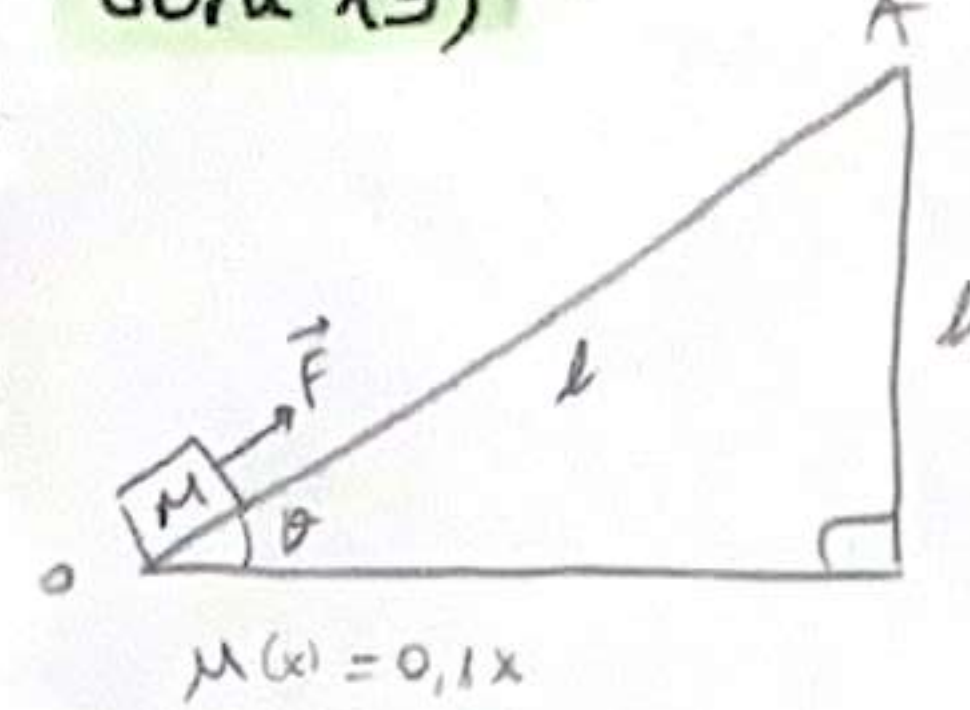
$$0.8T = 20 \quad T = 25$$

$$25 \cdot \frac{3}{5} = 15 + 5 = 20$$

b) Cismin hızı nedir?

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

Soru 19)



$$F - m_1 g \sin \theta - m_1 g \cdot \frac{x}{10} \cos \theta = m_1 a$$

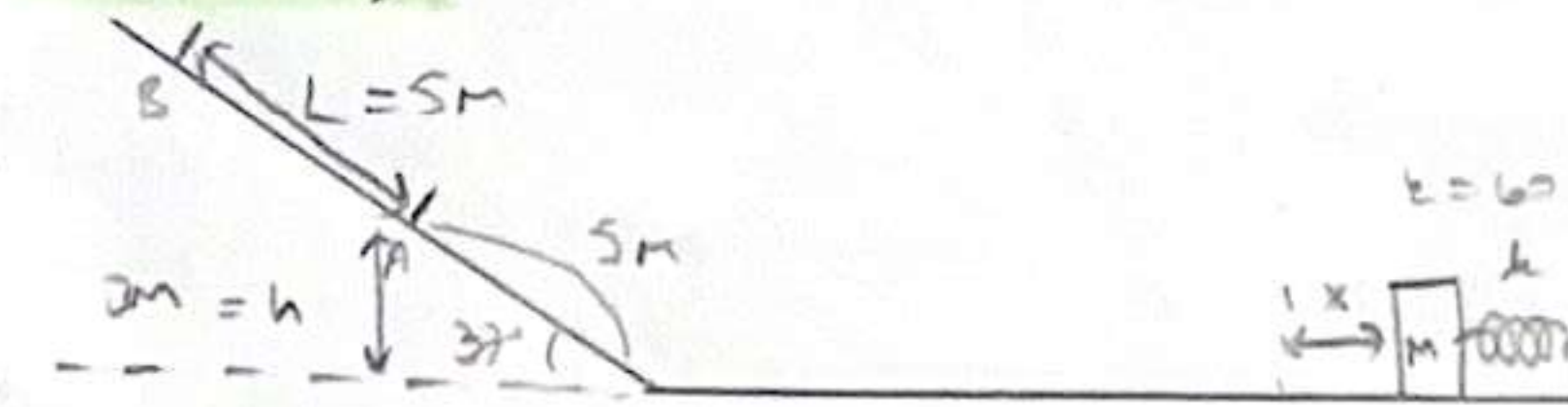
$$F = m_1 g (\sin \theta + \frac{x}{10} \cos \theta)$$

b) F kuvveti yaptığı iş?

$$\int_0^L F dx = \int_0^L (m_1 g (\sin \theta + \frac{x}{10} \cos \theta)) dx = m_1 g (x \sin \theta + \frac{x^2}{20} \cos \theta) \Big|_0^L$$

$$\Rightarrow W_F = m_1 g (L \sin \theta + \frac{L^2}{20} \cos \theta)$$

Soru 20)



$$\frac{1}{2} \cdot 60 \cdot x^2 = W_A + mgh + W_S$$

$$30 x^2 = 60 + 20$$

$$x = \sqrt{\frac{8}{3}}$$

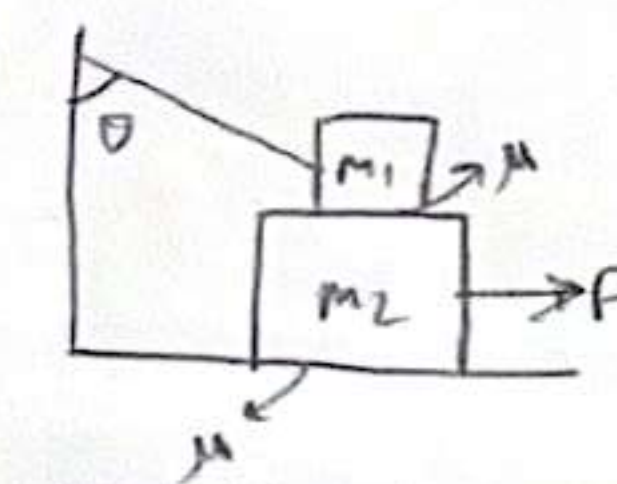
M=1kg, serbest bırakıldı  
kuvveti serbest bırakıldı 0.5 4m.

Cisim B noktasında duruyor. Bu  
yoga durumu muhtemelen ne olabilir?

$$W_{\text{net}} = \Delta K = K_2 - K_1 = 0$$

$$F = kx \quad k = 10 \quad x = 1.0 \quad a = 60x$$

Soru 21)



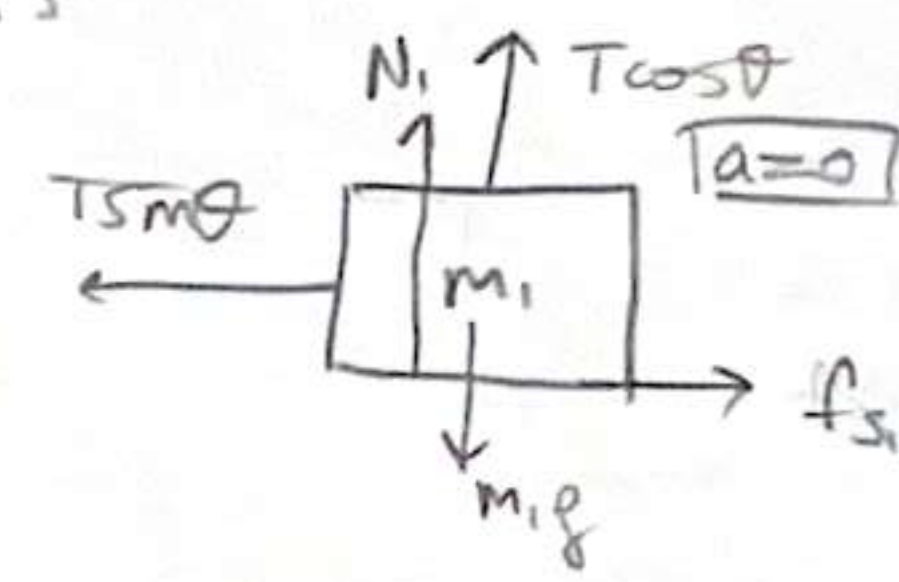
$$N_1 + T \cos \theta = m_1 g$$

$$f_{s1} = \mu (m_1 g - T \cos \theta)$$

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

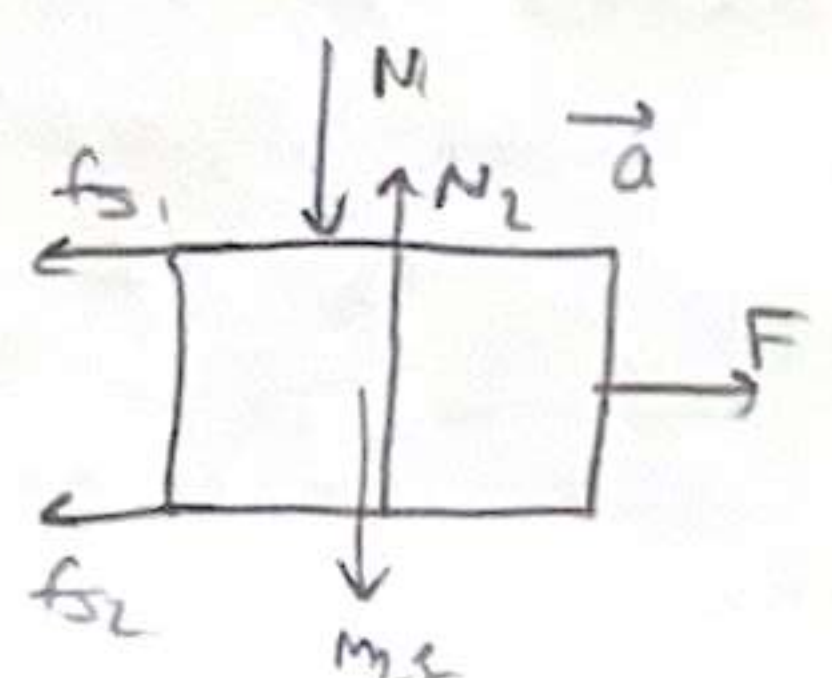
$$\mu (m_1 g - T \cos \theta) = T \sin \theta$$

$$\mu m_1 g = T \mu \cos \theta + T \sin \theta$$



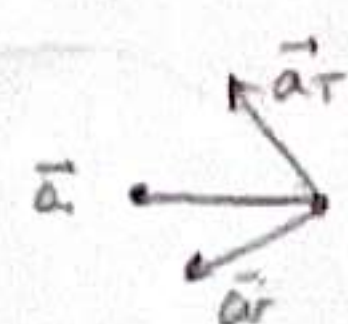
$$T (\mu \cos \theta + \sin \theta) = \mu m_1 g$$

$$T = \frac{\mu m_1 g}{\mu \cos \theta + \sin \theta}$$





c)  $t=1$  rad  $\vec{a}_r \rightarrow \vec{a}_r$  bulunur.



$$\vec{a} = \vec{a}_r + \vec{a}_t$$

$$a^2 = (a_r)^2 + (a_t)^2$$

$$40 =$$

$$a_r = \frac{|\vec{v} \times \vec{a}|}{|\vec{v}|} \Rightarrow \frac{|(v_x \cdot a_y) - (v_y \cdot a_x)|}{|\vec{v}|} = \boxed{2\sqrt{2} = a_r}$$

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

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

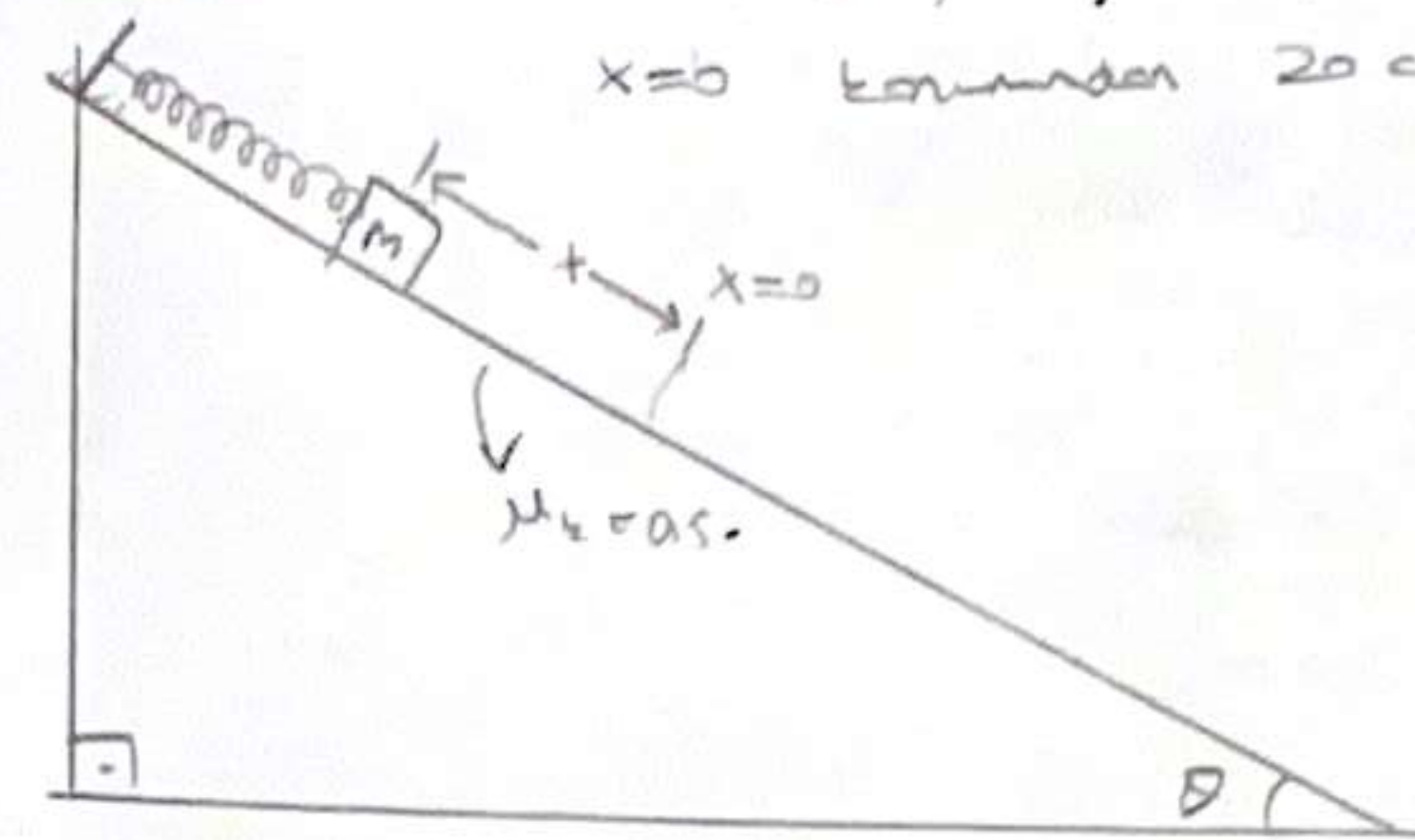
$$a^2 = (a_r)^2 + (a_t)^2$$

$$40 = (a_r)^2 + 8$$

$$\boxed{4\sqrt{2} = a_r}$$

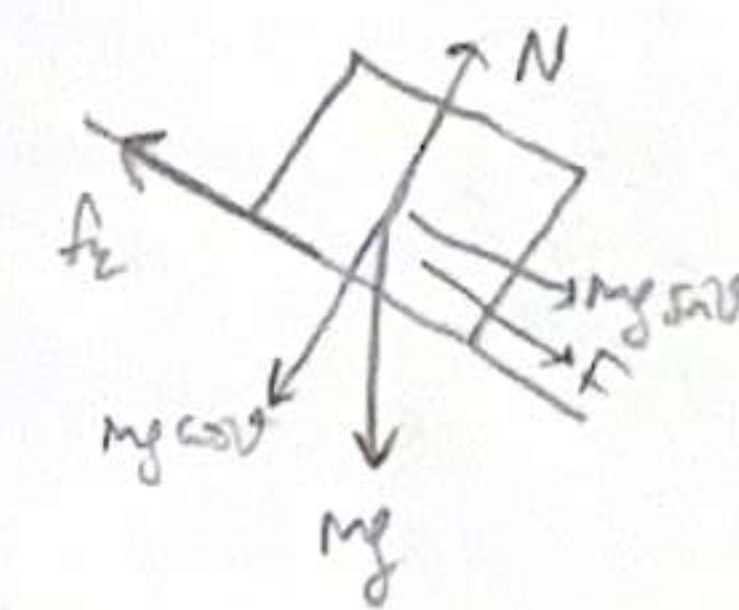
### Soru 23)

$m = 10 \text{ kg}$ ,  $\theta = 37^\circ$ ,  $k = 600 \text{ N/m}$ ,  $\mu_k = 0.5$   
 $x=0$  konumunda 20 cm sıkıştırılmış yayla serbest bırakılır.



a) Yay serbest bırakıldığında yayın sisteminde kinetik ve deye kinetik enerji etki eden bir kuvvetin yaptığı işi hesaplayınız

$$F) W_y = \frac{1}{2} k x^2 = \frac{1}{2} \cdot 600 \cdot \frac{4}{100} = \boxed{12 \text{ J}}$$



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

$$10 \cdot 10 \cdot \frac{8}{10} \cdot \frac{1}{2}$$

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

$$10 \cdot 10 \cdot \frac{6}{10}$$

b) Deye konumunda geometrik seratin bulunur

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

$$16 = \frac{1}{2} \cdot 10 v_5^2 \quad \frac{16}{5} \Rightarrow \boxed{\frac{4}{\sqrt{5}} = v_5 \text{ (m/s)}}$$

### Soru 24) Bir parçacık t=0'da orijinden hareketi gösterir

$\vec{v} = (3t^2)\hat{i} + (2t+1)\hat{j}$  (m/s) olarak verilen zamanla ilgili bir hızla  $x=3$  d-  
 leminde hareket ettirilir.

a)  $t=1$  s r'n hızı time ve konum vektörünü bulunur.

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

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

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

b)  $t=1$  rad time ve konum vektörünü kullanarak açıyı bulunur

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

$$\boxed{\theta = 45^\circ}$$