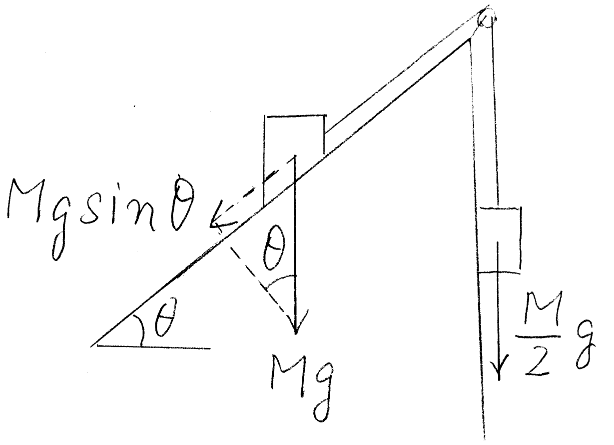
8 (1) AとBで等速運動になることから,

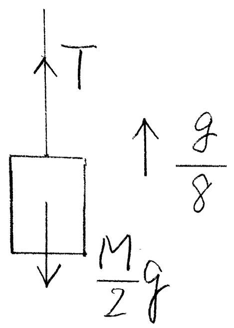


$$Mg\sin\theta = \frac{M}{2}g$$

$$\sin\theta = \frac{1}{2}$$

$$\theta = \underline{30^\circ}$$

(2)

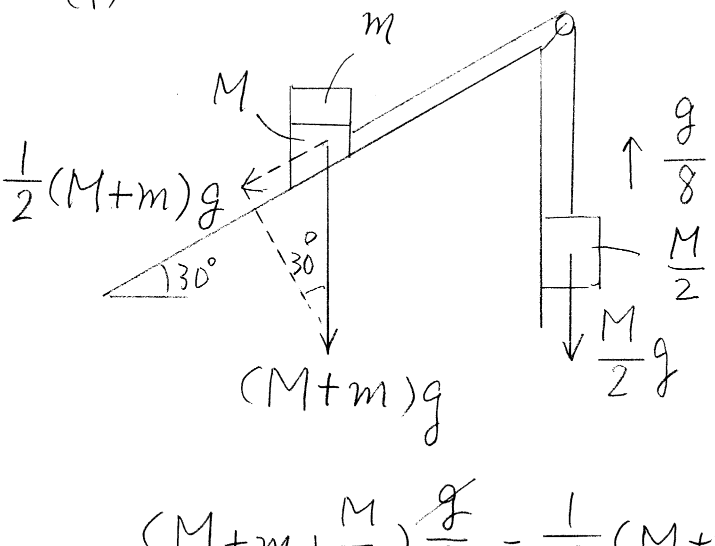


$$\frac{M}{2}\cdot\frac{g}{8} = T - \frac{M}{2}g$$

$$T = \underline{\frac{9}{16}Mg}$$

(3) $v^2 - 0^2 = 2\cdot\frac{g}{8}\cdot l$ $\quad v = \underline{\frac{\sqrt{gl}}{2}}$

(4)

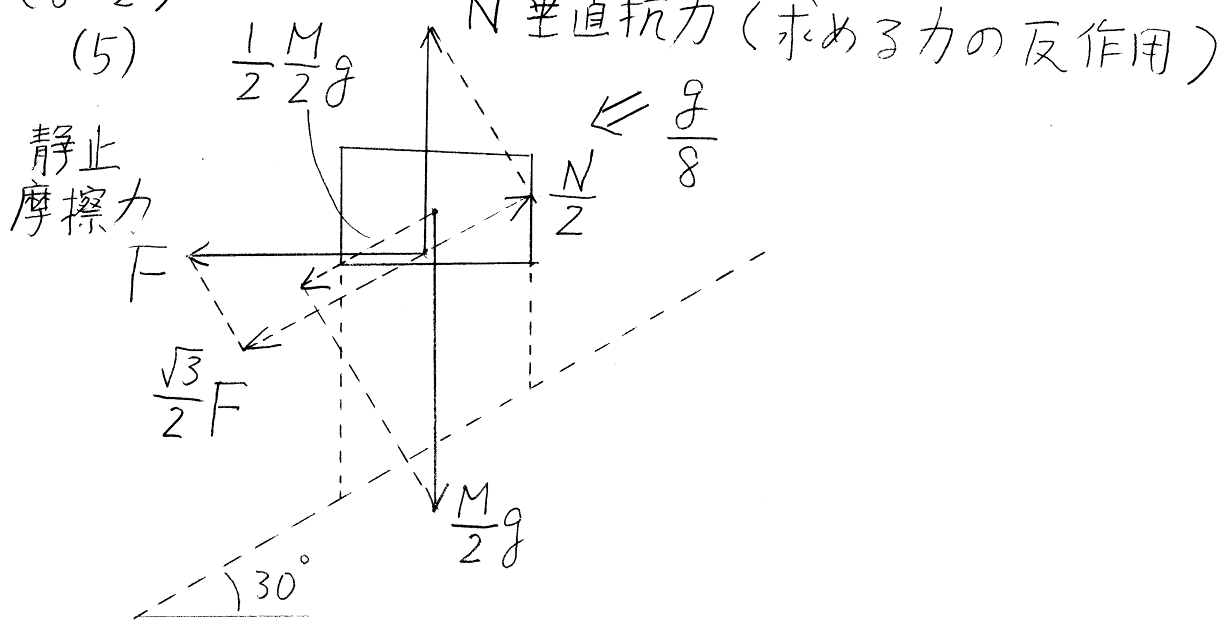


$$\left(M+m+\frac{M}{2}\right)\frac{\cancel{g}}{8} = \frac{1}{2}(M+m)\cancel{g} - \frac{M}{2}\cancel{g}$$

$$\left(\frac{3}{2}M+m\right)\frac{1}{8} = \frac{1}{2}m \qquad \frac{3}{2}M+m = 4m \qquad m = \underline{\frac{M}{2}}$$

(8-2)

(5)



斜面方向の運動方程式

$$\frac{M}{2}\cdot\frac{g}{8}=\frac{1}{2}\cdot\frac{M}{2}g+\frac{\sqrt{3}}{2}F-\frac{N}{2}\quad\cdots①$$

斜面と垂直な方向の運動方程式

$$\frac{1}{2}F+\frac{\sqrt{3}}{2}N-\frac{\sqrt{3}}{2}\cdot\frac{M}{2}g=0\quad\cdots②$$

①より $-\frac{3}{16}Mg-\frac{\sqrt{3}}{2}F+\frac{N}{2}=0\quad\cdots①'$

②×√3 $\frac{\sqrt{3}}{2}F+\frac{3}{2}N-\frac{3}{4}Mg=0\quad\cdots②'$

①'+②' $-\frac{15}{16}Mg+2N=0$ 　 $N=\frac{15}{32}Mg$

(6) $F\leqq\mu N$ であればよい。

Nを②'に代入する。

$$\frac{\sqrt{3}}{\cancel{2}}F+\frac{\cancel{45-48}^{\,-3}}{\cancel{64}\,32}Mg=0\qquad F=\frac{1}{\sqrt{3}}\times\frac{3}{32}Mg$$

$$\mu\geqq\frac{F}{N}=\frac{\cancel{3Mg}\times\cancel{32}}{\sqrt{3}\times\cancel{32}\times_{5}\cancel{15Mg}}=\frac{\sqrt{3}}{15}$$