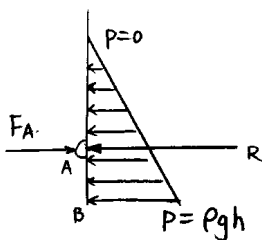
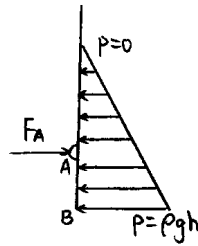


9) (7 pts)

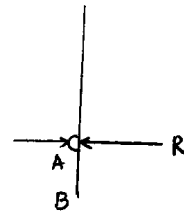
① Still some students didn't draw FBD or drew it wrong. 1 pt is taken off for not drawing FBD or bad FBD. Among the three FBD's below, (a) is considered to be bad because this FBD means there are both distributed pressure and concentrated force  $R$  on the board. You should either draw (b) or (c)



(a)



(b)



(c)

② The condition for the board to pull away is that the reaction force at B  $F_B = 0$ . This condition must be imposed. You may draw  $F_B$  in the FBD, but later on you should specify this condition. Otherwise there is no way to find  $h$  or  $F_A$ . 2 pts for not imposing this condition.

③  $R = \rho g \bar{h} A$ , where  $\bar{h} = \frac{h}{2}$ , and  $A = hl$ . The line of action of  $R$  is  $\frac{h}{3}$  away from the bottom. If you didn't calculate  $R$  and its position correctly, e.g. take  $\bar{h} = \frac{2h}{3}$ , take  $R = \rho g V$ , or let line of action of  $R$  to be  $\frac{h}{2}$  away from the bottom, 1~2 pts are taken off

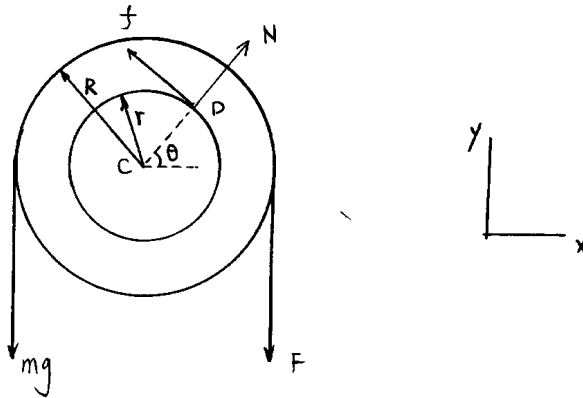
④ Algebra mistakes, vector and scalar bad notations, e.g. missing unit vector  $\hat{i}$  in the answer, 0.5 ~ 1 pt is taken off.

10) (10 pts)

① Again, no FBD or wrong FBD — 1 pt

② If you say the force at D  $F_D$  is vertical, you should also tell the reason. I didn't really take off pts for this because probably you had it in your brain, but it would be better if you have good reasoning for your argument

③ Most of the student drew FBD as the following.



Then you should have 4 eqns for 4 unknowns ( $F$ ,  $N$ ,  $f$  and  $\theta$ ), i.e. for example:

$$\left. \begin{aligned} \sum F_x = 0 &= N \cos \theta - f \sin \theta \\ \sum F_y = 0 &= N \sin \theta + f \cos \theta - mg - F \\ \sum M_{/O} = 0 &= mg(R + r \cos \theta) - F(R - r \cos \theta) \\ \text{slip condition: } &f = \mu N \end{aligned} \right\} \Rightarrow F, N, f, \theta$$

Leaving unknowns in the answer is not really solving this problem, e.g. leaving  $\theta$  in  $F$  is incomplete. I took 2 pts off for each necessary but missing equation.

④ A lot of mistakes in geometry, e.g. taking radius  $a$  into the calculation, etc. <sup>P3</sup>  
1 ~ 2 pts for this kind of mistake.

⑤ pure algebra mistake, bad notations, units missing — 0.5 ~ 1 pt.