Your Name: _____

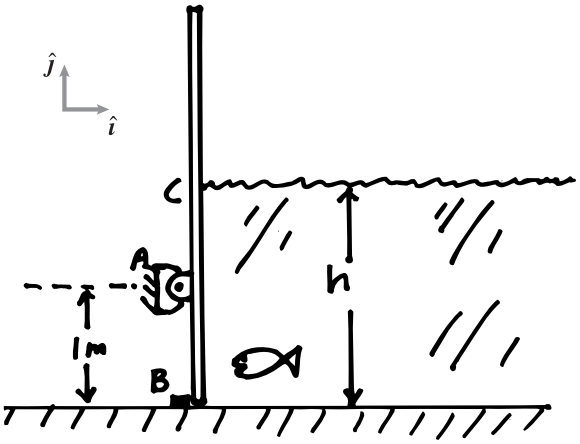
ENGRD 202 Quiz 5

Section day & time: _____

April 4, 2003

TA name & section #: _____

9) (7 pts) Water is held in a reservoir by a board with negligible weight that is 5 meters long. It is hinged 1 meter off the bottom at A and kept from leaking by a seal at B. What is h when the board starts to pull away from the stop at B? At that h what is the force of the hinge on the board? Assume $\rho = 1000\,\mathrm{kg/m^3}$, $g = 10\,\mathrm{N/kg}$.



$h =$

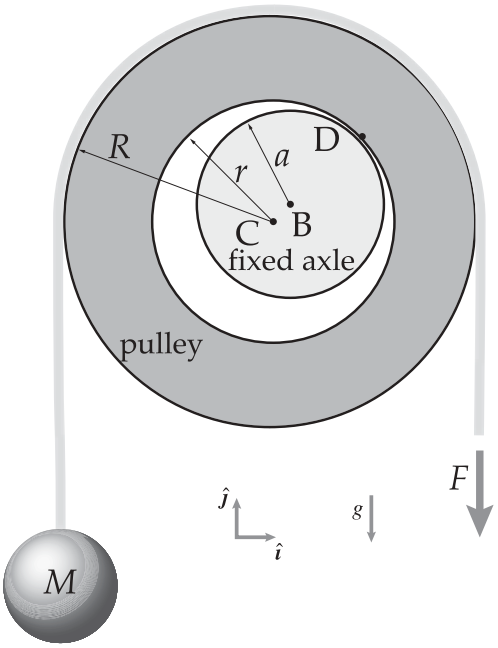
$\underline{\mathbf{F}}_A =$

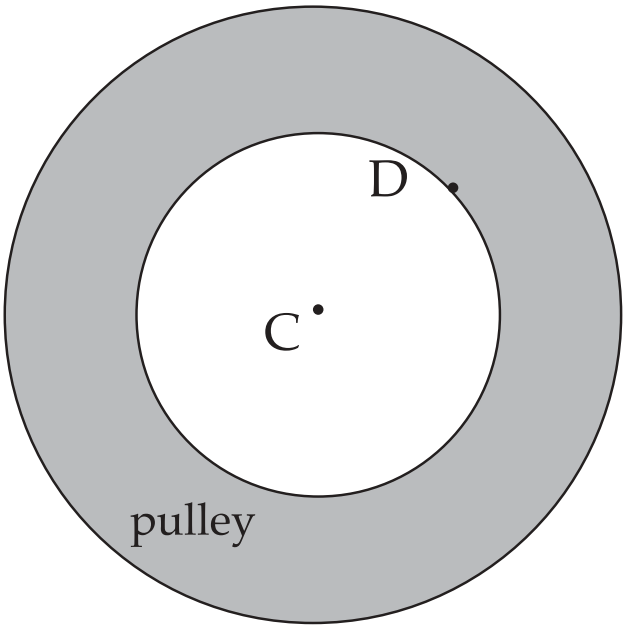
10) (10 pts) A mass M is steadily raised by pulling with a force F on a rope going over a negligible-mass pulley on an unlubricated journal bearing (no ball bearings). The friction coefficient between the pulley and its axle is $\mu = \tan\phi$. (The figure at right is the start of a drawing for one useful FBD.)

a) Find F in terms of M, g, R, r, a and μ (or ϕ or $\sin\phi$ or $\cos\phi$ — whichever is most convenient, for example $\cos(\tan^{-1}(\mu))$ is just $\cos\phi$). [Hint: Finding the location of the contact point D is probably part of your solution.]

b) Evaluate F in the special case that $M = 100\,\text{kg}, g = 10\,\text{N/kg}, r = 1\,\text{cm}, R = 2\,\text{cm}$, and $\mu = \sqrt{3}/3$ (so $\phi = \pi/6, \sin\phi = 1/2, \cos\phi = \sqrt{3}/2$).

c) What happens instead if μ is very large, say the limit $\mu \to \infty$? Does the needed force F go to ∞ or what?





a) $F =$

b) $F =$

c)