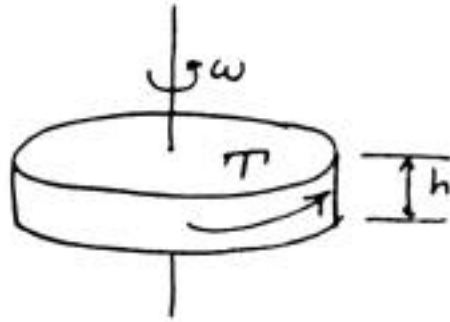# Problem 5.20

Solid disc spinning up

Consider a solid disc with radius R, thickness h, and density ρ. If the disc is free to rotate about its axis without friction, and if a torque T is applied to it about that axis, show by applying the angular momentum theorem that its angular velocity ω obeys the equation

$$I\frac{d\omega}{dt} = T$$

where

$$I = \frac{\pi}{2}\rho R^4 h$$

HINT