69. We make the unconventional choice of *clockwise* sense as positive, so that the angular acceleration are positive (as is the linear acceleration of the center of mass, since we take rightwards as positive).

(a) We approach this in the manner of Eq. 12-3 (*pure rotation* about point P) but use torques instead of energy:

$$\tau = I_P\,\alpha \quad \text{where } I_P = \frac{1}{2}MR^2 + MR^2$$

where the parallel-axis theorem and Table 11-2(c) has been used. The torque (relative to point P) is due to the $F = 12$ N force and is $\tau = F(2R)$. In this way, we find

$$\alpha = \frac{(12)(0.20)}{0.05 + 0.10} = 16 \text{ rad/s}^2 \ .$$

Hence, $a_{\text{com}} = R\alpha = 1.6 \text{ m/s}^2$.

(b) As shown above, $\alpha = 16 \text{ rad/s}^2$.

(c) Applying Newton's second law in its linear form yields

$$(12 \text{ N}) - f = Ma_{\text{com}} \quad .$$

Therefore, $f = -4.0$ N. Contradicting what we assumed in setting up our force equation, the friction force is found to point *rightward* (with magnitude 4.0 N).