81. (First problem in **Cluster 1**)

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

$$(200\text{ N}) - f = M_{\text{cart}}\, a \quad .$$

Therefore, $f = 200 - (50.0)(3.00) = 50$ N.

(b) The torque associated with the friction is $\tau_f = fR = (50)(0.200) = 10$ N·m. (We make the unconventional choice of the clockwise sense as positive, so that the frictional torque and this angular acceleration are positive.)

(c) Applying the rotational form of Newton's second law (relative to the axle) yields

$$\tau_f = I\alpha \qquad\qquad \text{where } \alpha = \frac{a}{R} = 15.0\text{ rad/s}^2 \ .$$

Therefore, $I = 0.667$ kg·m^2.