Phys 101 – Sec #1  Quiz # 4 (Ch. 5 & 6)

Name:  

ID #

1- A 3.0 kg block is placed on top of a 9.0 kg block as shown in the figure. A horizontal force \( F = 20 \text{ N} \) is applied to the 9.0 kg block, which slides on the frictionless surface AB. Assuming that the 3.0 kg block does not slip, find the frictional force exerted by the 9.0 kg block on the 3.0 kg block. (Find magnitude & direction).

\[
\text{For the system of two blocks:} \\
F_{\text{net}} = ma \\
F = (3+9) a \\
\frac{20}{12} = \frac{5}{3} \frac{m}{s^2}.
\]

Then, focus on the top block:

\[
\frac{F}{3} = ma = 3 \left( \frac{5}{3} \right) = 5 \text{ N (\hat{i})}
\]

directed to the right.

2- A roller-coaster car has a mass of 1200 kg when fully loaded. As the car passes over the top of a circular hill of radius 18 m, its speed is constant and equal to 11 m/s. What are the magnitude and direction of the force exerted by the track on the car?

Apply Newton's 2nd law along the vertical axis.

\[
F_{\text{net}} = ma \\
N - mg = -m \frac{v^2}{r}
\]

\[
N = m \left( g - \frac{v^2}{r} \right) = 1200 \left( 9.8 - \frac{11^2}{18} \right) = 3693 \text{ N}
\]