

38. We will start by assuming that the normal force (on the car from the rail) points up. Note that gravity points down, and the y axis is chosen positive upwards. Also, the direction to the center of the circle (the direction of centripetal acceleration) is down. Thus, Newton's second law leads to

$$N - mg = m \left(-\frac{v^2}{r} \right) .$$

- (a) When $v = 11$ m/s, we obtain $N = 3.7 \times 10^3$ N. The fact that this answer is positive means that \vec{N} does indeed point upward as we had assumed.
- (b) When $v = 14$ m/s, we obtain $N = -1.3 \times 10^3$ N. The fact that this answer is negative means that \vec{N} points opposite to what we had assumed. Thus, the magnitude of \vec{N} is 1.3 kN and its direction is *down*.