

44. The free-body diagram (for the hand straps of mass  $m$ ) is the view that a passenger might see if she was looking forward and the streetcar was curving towards the right (so  $\vec{a}$  points rightwards in the figure) We note that  $|\vec{a}| = v^2/R$  where  $v = 16 \text{ km/h} = 4.4 \text{ m/s}$ .

Applying Newton's law to the axes of the problem ( $+x$  is rightward and  $+y$  is upward) we obtain

$$\begin{aligned} T \sin \theta &= m \frac{v^2}{R} \\ T \cos \theta &= mg . \end{aligned}$$

We solve these equations for the angle:

$$\theta = \tan^{-1} \left( \frac{v^2}{Rg} \right)$$

which yields  $\theta = 12^\circ$ .

