Going around a curve

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Example:

A 4000 kg truck rounds a curve at 20 m/s. The radius of the curve is 100 m and the coefficient of friction on dry pavement (μ) is 0.6.

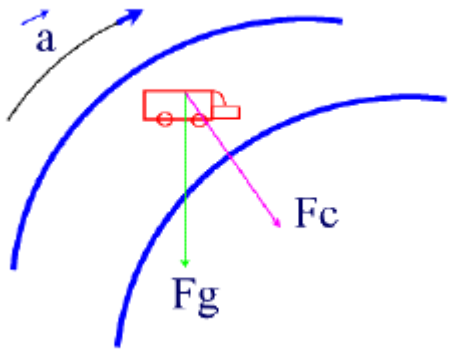
Find a) Fnet (The Net Force)
b) Ff (The Maximum Force of Friction)
c) if the truck will skid when μ = 0.15 (icy conditions)

Solution:

a) Fnet = Fc

$$Fc = \frac{mv^2}{R}$$

$$= 16\,000 \text{ N}$$



b)

$$Ff = \mu Fn = \mu(Fg) = \mu(m)(g)$$

$$= 23\,520 \text{ N}$$

c) When μ = 0.15, the force of friction is

$$Ff = \mu (m)(g) = 5\,880 \text{ N}$$

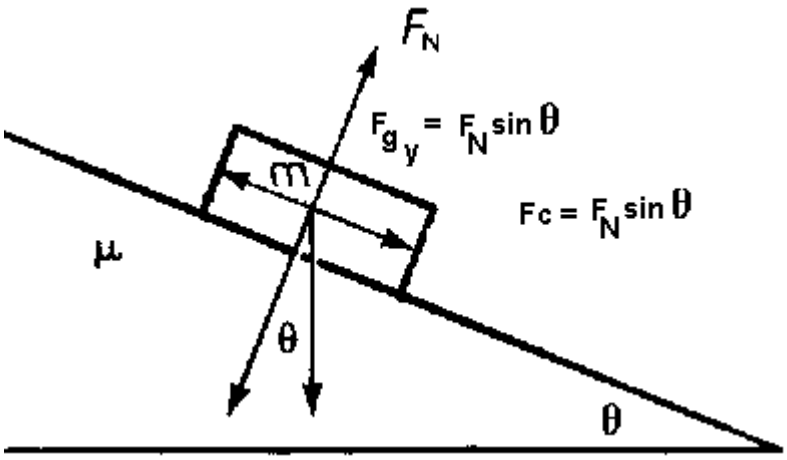
Note that the force of friction in this case is less than net Force.
When this happens skidding will occur.

In general, for no skidding to take place, the following condition must take place

$F_f > F_{net}$

Road Design

Road designers accounts for skid conditions by building roads and access ramps at an angle. This counterbalances the centripetal force by "diluting" the force of gravity on the ramp.



$$F_{gy} = F_N \sin\theta = F_c$$
$$= m\frac{v^2}{R}$$

The purpose of banking is to reduce skidding, and improve traction on curves and access ramps.