Ex : A car of **m=1600 kg** travels at a constant speed of **v=20 m/s** along a flat, circular road of radius **R=190 m**. What is the minimum value of μ_s that will prevent the car from slipping?

◦ Begin with free-body diagram of the car.

◦ Now use Newton's 2^{nd} law.

$$\Sigma F_y = ma_y \ : \quad N - mg = ma_y = 0, \quad N = mg$$

$$\Sigma F_r = ma_r \ : \quad f_s = \frac{mv^2}{R}, \quad f_s^{max} = \mu_s N = \mu_s mg$$

$$\Rightarrow \quad \mu_s mg = \frac{mv^2}{R}, \quad \mu_s = \frac{v^2}{gR}$$

◦ Now plug in the known parameters.

$$\mu_s = \frac{(20\ m/s)^2}{(9.81\ m/s^2)(190\ m)} = 0.21$$

◦ Note two things:

1). $\mu_s \propto \mathrm{v}^2$; μ_s increases with velocity.

2). μ_s does not depend on the vehicle's mass.