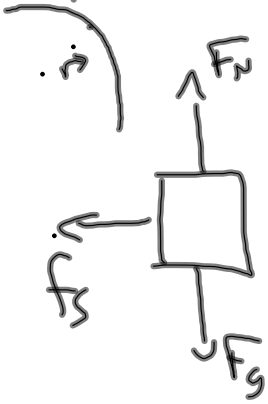
Circular Motion

2 cases of cars moving around curves.

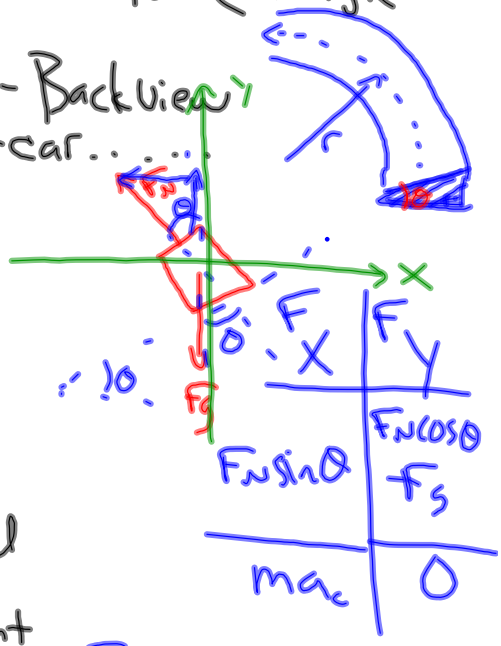
Unbanked or Banked

Top view Flat



FBD - Back view of car.....

Turn @ an angle



To have a "constant" a_c or safe speed

$f_s = \frac{mv^2}{r}$ ← constant speed

$f_{s_{max}} = \mu_s F_N = \frac{mv^2}{r}$

$\mu_s mg = \frac{mv^2}{r}$

to know maximum "safe speed" solve for v

$v = \sqrt{r \cdot \mu_s \cdot g}$

$F_N \sin\theta = ma_c$

$F_N \sin\theta = \frac{mv^2}{r}$

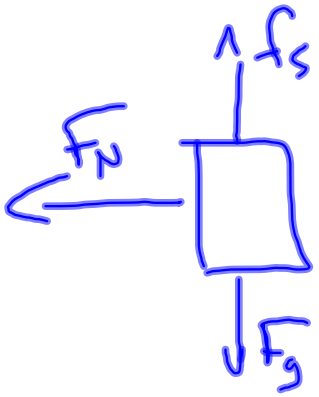
$F_N \cos\theta = mg$

$\Rightarrow F_N = \frac{mg}{\cos\theta}$

$\frac{mg\sin\theta}{\cos\theta} = \frac{mv^2}{r}$

$g\tan\theta = \frac{v^2}{r}$

$v = \sqrt{r \cdot g \cdot \tan\theta}$



F_x	F_y
F_N	f_s
	$-F_g$
ma	0

$$F_N = ma_c$$

$$f_N = \frac{mv^2}{r}$$

$$f_s = F_s$$

$$f_s = mg$$

$$f_{s_{max}} = \mu_s F_N = mg$$

$$F_N = \frac{mg}{\mu_s}$$

$$\frac{\cancel{m}g}{\mu_s} = \frac{\cancel{m}v^2}{r}$$

$$v = \sqrt{\frac{r \cdot g}{\mu_s}}$$