

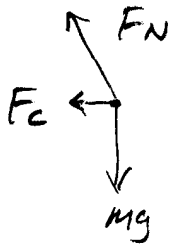
Centripetal Acceleration quiz 12-18-02

A car goes into a banked turn whose radius is 75 m. The angle of the track is 22° . The car's speed is such that there is no tendency to slide up or down the track. (In fact, the car could go around the turn on a frictionless track without sliding.)

Draw and label a good FBD.

(a) What is the speed of the car?

(b) If the car went 10 m/s faster, what would the new angle of the track have to be?



$$\sum F_y = 0$$

$$F_N \cos \theta - mg = 0$$

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

$$\sum F_x = \frac{mv^2}{r}$$

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

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

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

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

$$v^2 = gr \tan \theta$$

$$v = \sqrt{gr \tan \theta}$$

$$= \sqrt{9.8 \frac{m}{s^2} (75m) \tan 22^\circ}$$

a) $V = 17.2 \frac{m}{s}$

$$\tan \theta = \frac{v^2}{gr}$$

$$\tan \theta = \frac{(27.2 \frac{m}{s})^2}{9.8 \frac{m}{s^2} (75m)}$$

b) $\theta = 45.2^\circ$