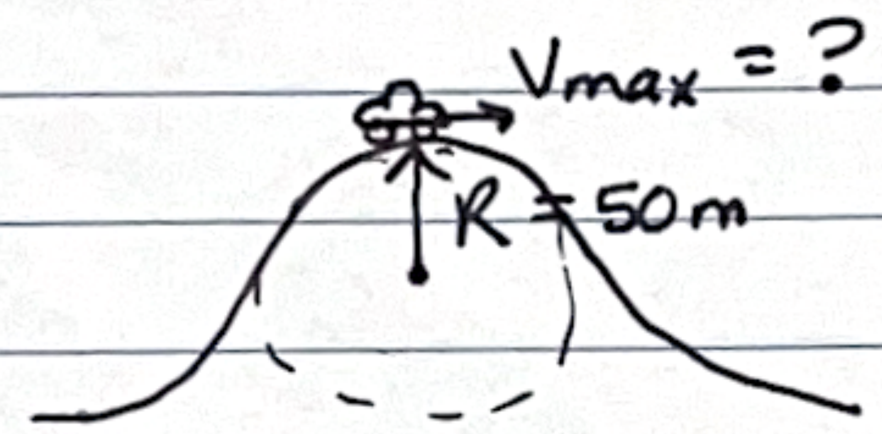
Ch 8 p. 199 #18

Sketch + translate



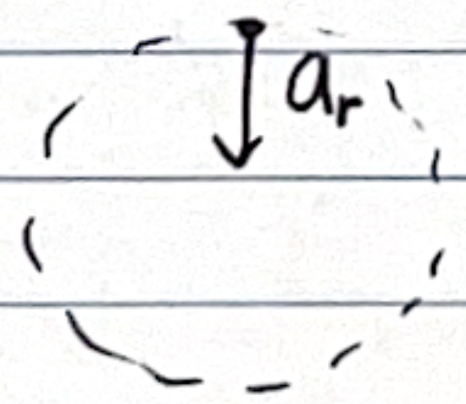
Simplify + Diagram

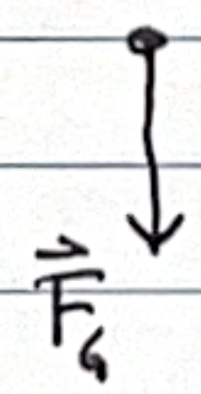
- model car as particle
- model motion as constant speed circular motion

} This is the general situation for forces for the car on the hill.

As speed increases, a_r increases, so ΣF_r must increase. The biggest ΣF_r can be is F_G, and this happens when $n = 0$ (when it just loses contact with the road).

So for V_{max} speed, the FBD looks like this





$\downarrow +r$

Represent mathematically

$$\Sigma F_r = m a_r$$

$$F_G = m\left(\frac{V_{max}^2}{R}\right)$$

$$\cancel{m}g = \cancel{m}\left(\frac{V_{max}^2}{R}\right)$$

$$\sqrt{gR} = V_{max}$$

Solve

$$V_{max} = \sqrt{(9.8\ N/kg)(50\ m)}$$

$$= \boxed{22\ m/s}$$