

Question 2:

Assuming a cloverleaf interchange has a radius of curvature of 80 meters at the tightest part of the turn, what is the fastest a car could travel around this curve without experiencing more than $1/2$ a g in acceleration? Assume the car is traveling at a constant speed. If the car was instead increasing speed at a rate of 2 m/s^2 , what would be the new overall magnitude of the acceleration experienced by the passengers?



1) constant speed

$$a_t = 0 \quad a_n = 4.905 \frac{\text{m}}{\text{s}^2} = \frac{v^2}{r}$$

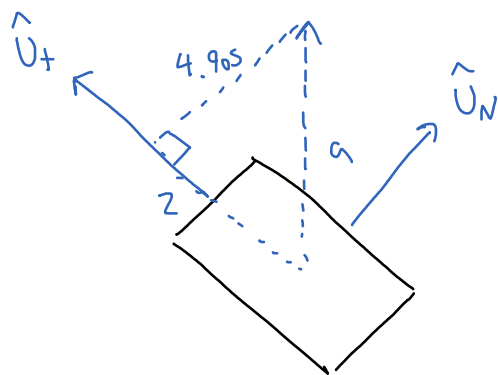
\uparrow
80m

$$v = \sqrt{(4.905 \frac{\text{m}}{\text{s}^2})(80\text{m})} = \boxed{19.8 \text{ m/s} \approx 44.3 \text{ mph}}$$

2)

$$a_t = 2 \text{ m/s}^2$$

$$a_n = 4.905 \text{ m/s}^2$$



$$a = \sqrt{2 + 4.905}$$

$$a = 5.297 \text{ m/s}^2$$