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 \text{ m/s}^2, what would be the new overall magnitude of the acceleration experienced by the passengers?

1) Constant speed

\[ \alpha_t = 0 \quad \alpha_n = 4.90 \text{ s} \frac{\text{m}}{\text{s}^2} = \frac{V^2}{r} \]

\[ V = \sqrt{(4.90 \text{ s} \frac{\text{m}}{\text{s}^2})(80 \text{ m})} = 19.8 \text{ m/s} \approx 44.3 \text{ mph} \]
2) \[ a_t = 2 \text{ m/s}^2 \quad a_n = 4.905 \text{ m/s}^2 \]

\[ a = \sqrt{(2)^2 + (4.905)^2} \]

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