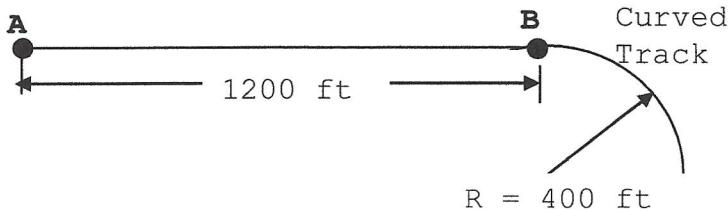


Problem 1: Particle Kinematics I

A racing car driver starts from rest at point A and accelerates uniformly for 10 seconds until she reaches point B, a distance of 1200 ft. What is her tangential and normal component of acceleration?

- a. Just before she reaches B.
- b. Just after she passes B.



a) Rectilinear Motion

$$a = \text{CONSTANT}$$

$$v = \int a dt = at + C_1$$

$$s = \int v dt = \frac{1}{2}at^2 + C_1 t + C_2$$

Boundary/Initial Conditions $t=0, s=0, v=0 \therefore C_1 = C_2 = 0$

$$s = \frac{1}{2}at^2 \Rightarrow 1200 = \frac{1}{2}a(10)^2 \quad a = 24 \text{ ft/s}^2 \xrightarrow{\text{B}}$$

b) Curvilinear Motion

$$\vec{a} = \vec{a}_T + \vec{a}_N$$

$$\vec{a}_T = 24 \text{ ft/s}^2 \text{ (From a)}$$

$$a_N = \frac{v^2}{R} \Rightarrow v = at \text{ (From a)} \quad v = 24(10) = 240 \text{ Fps}$$

$$a_N = \frac{240^2}{400} = 144 \text{ ft/s}^2 \downarrow^B$$

$$\underline{\vec{a} = 24 \text{ Fps}^2 \xrightarrow{\text{B}} + 144 \text{ Fps}^2 \downarrow^B}$$