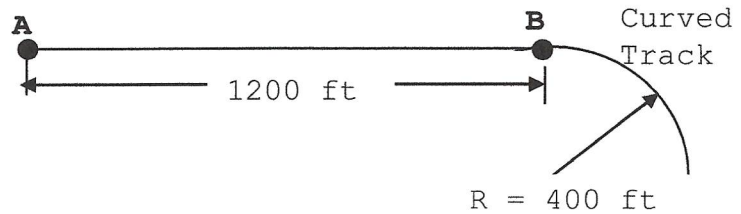


## Problem 1: Particle Kinematics I

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?

- Just before she reaches *B*.
- Just after she passes *B*.



## a) Rectilinear Motion

$$a = \text{CONSTANT}$$

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

$$s = \int v dt = \frac{1}{2}at^2 + C_1t + C_2$$

BOUNDARY/INITIAL CONDITIONS  $t=0, s=0, v=0 \therefore C_1=C_2=0$

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

## b) Curvilinear Motion

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

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

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

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

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