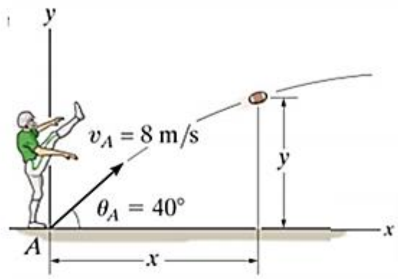
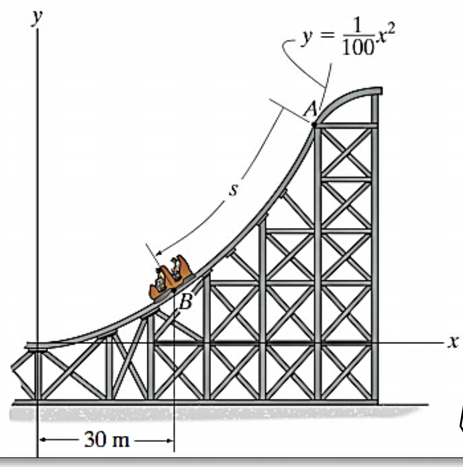
The ball is kicked with an initial speed $v_A = 8$ m/s at an angle $\theta_A = 40°$ with the horizontal. Find the equation of the path, $y = f(x)$, and then determine the normal and tangential components of its acceleration when $t = 0.25$ s.



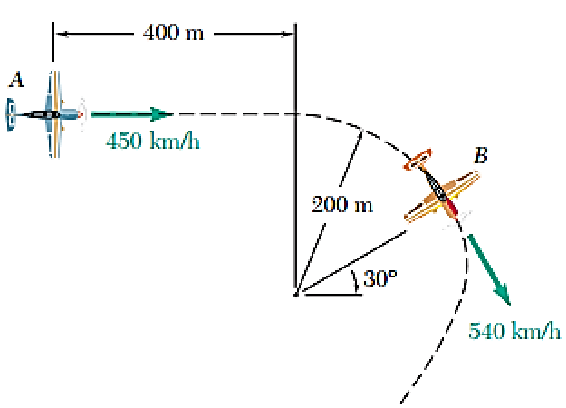
1

If the roller coaster starts from rest at A and its speed increases at $a_t = (6 - 0.06s)$ m/s^2, determine the magnitude of its acceleration when it reaches B where $s_B = 40$ m.



2

At a given instant in an airplane race, airplane A is flying horizontally in a straight line, and its speed is being increased at the rate of 8 m/s^2. Airplane B is flying at the same altitude as airplane A and, as it rounds a pylon, is following a circular path of 300-m radius. Knowing that at the given instant the speed of B is being decreased at the rate of 3 m/s^2, determine, for the positions shown, (*a*) the velocity of B relative to A, (*b*) the acceleration of B relative to A.

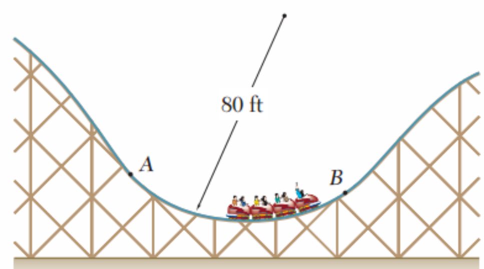


3

A particle moving in the x-y plane has a position vector given by $\mathbf{r} = \frac{3}{2}t^2\mathbf{i} + \frac{2}{3}t^3\mathbf{j}$, where $\mathbf{r}$ is in inches and t is in seconds. Calculate the radius of curvature ρ of the path for the position of the particle when $t = 2$ sec. Sketch the velocity $\mathbf{v}$ and the curvature of the path for this particular instant.

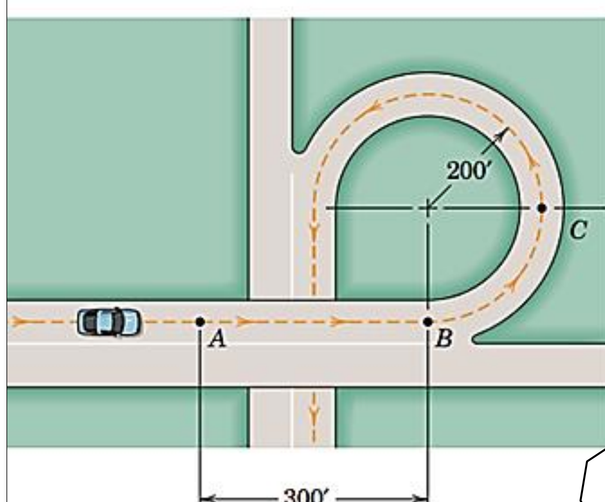
4

Determine the maximum speed that the cars of the roller-coaster can reach along the circular portion AB of the track if the normal component of their acceleration cannot exceed 3g.



5

The car is traveling at a speed of 60 mi/hr as it approaches point A. Beginning at A, the car decelerates at a constant 7 ft/sec^2 until it gets to point B, after which its constant rate of decrease of speed is 3 ft/sec^2 as it rounds the interchange ramp. Determine the magnitude of the total car acceleration (*a*) just before it gets to B, (*b*) just after it passes B, and (*c*) at point C.



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