P8.5-8) A bicyclist builds up speed until she is traveling at $v_1 = 20$ mph. At this point, she coasts down a $\theta = 10^0$ hill. After covering a distance of $d = 0.25$ mile, her speed reaches $v_2 = 35$ mph. Assuming that the wheels don't slip, determine the amount of non-conservative work done on the bike-rider system. Assume that the wheel may be approximated as rings (i.e. $I_G = mr^2$). The rider, frame and wheels weigh $W_{rider} = 130$ lb, $W_{frame} = 2$ lb and $W_{wheel} = 1$ lb, respectively. The wheel radius is $r = 350$ mm.

Given:

Find:

Solution

Write down the work-energy balance equation and Indicate which terms will go to zero.

Calculate the mass moment of inertia of the wheel with respect to its center of mass.

I_{wheel} = _____

Determine the change in potential energy of the system.

ΔV = _____

Determine the kinetic energy of the system.

What is the change in kinetic energy of the rider and frame?

ΔT = _____

What is the change in kinetic energy of the wheels?

$\Delta T =$ _____

Use the work-energy balance equation to determine the non-conservative work.

$U =$ _____