

95. (Second problem in **Cluster 1**)

Converting to SI units, $v_0 = 8.3$ m/s and $v = 11.1$ m/s. The incline angle is $\theta = 5.0^\circ$. The height difference between the car's highest and lowest points is $(50 \text{ m}) \sin \theta = 4.4$ m. We take the lowest point (the car's final reported location) to correspond to the $y = 0$ reference level.

(a) Using Eq. 8-31 and Eq. 8-29, we find

$$f_k d = -\Delta K - \Delta U \implies f_k d = \frac{1}{2} m (v_0^2 - v^2) + mgy_0 .$$

Therefore, the mechanical energy reduction (due to friction) is $f_k d = 2.4 \times 10^4$ J.

(b) With $d = 50$ m, we solve for f_k and obtain 471 N, which can be rounded to 470 N.