Module 09-Lesson 3

Work for a Variable Force

Question 1: Spider silk has remarkable elastic properties. A particular strand stretches $x = 9.6$ cm when a fly hits it. How much work did the force exerted by the fly's impact do on the silk strand? Assume that the force required to stretch the strand obeys Hooke's Law with a constant $k = 70$ mN/m.

Question 2: A particle starts from rest at $x = 0$ and moves to $x = d$ under the action of a variable force $F(x)$, given in Fig. 1. Find expressions for the work done by the force acting on the particle from $x = 0$ to $x = \frac{d}{2}$ and from $x = 0$ to $x = d$, in terms of the given variables.
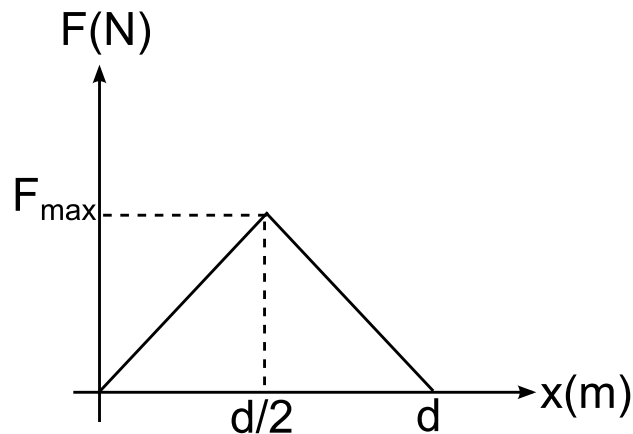

FIG. 1: Force as a function of distance.

Problem: A force pointing in the x-direction is given by $F(x) = ax^{3/2} + \frac{b}{x}$, where $a = 0.5$ N$^{3/2}$ and $b = 1$ N m. Find the work done by this force as it acts on an object moving it from $x = 0$ to $x = 10$ m.