

Assignment 17 (11/6)

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Problem 1

Problems 6.5.(11, 20, 26, 32, 34).

Problem 2

A uniformly heavy chain of length a initially has length b hanging off of a table. The remaining part of chain $a - b$, is coiled on the table. Assume that the chain has density per unit length given by λ . Suppose the chain is released so that it starts to slide of the table.

1. Show that the amount of work done by gravity when the last link of the chain leaves the table is given by

$$\frac{1}{2}g\lambda(a^2 - b^2)$$

2. Show that the velocity of the chain when the last link of the chain leaves the table is

$$v = \sqrt{g \frac{a^2 - b^2}{a}}$$

Problem 3

Suppose a variable force F is applied to an object of unit mass from time $t = 0$ to $t = 5$, so that its velocity vector v as a function of time t is given according to the following graph. In the graph

- the first part is parabolic of the form $4v = 3t^2$,
- the second part is linear and
- the third part is circular with center at the origin.

(a) Express F as a function of t .

(b) Calculate work done by F in time $t \in (0, 5)$.

