Work Assignment

Aaron Tresham

8/10/2016

1 Work Assignment

1.1 Question 1

A spring with natural length 0.1 m has spring constant $k = 5$ N/m. How much work (in joules) is done stretching the spring to 0.2 m? [Answer: 0.025 J]

1.2 Question 2

A force of 40 N is required to hold a spring that has been stretched from its natural length of 10 cm to a length of 15 cm. How much work (in joules) is done in stretching the spring from 15 cm to 18 cm. [Answer: 1.56 J]

[Hint: Remember to work in meters.]

1.3 Question 3

You have a 100-foot cable that weighs 300 pounds. [Assume uniform density; that is, the cable weighs $\frac{300}{100} = 3$ pounds/foot.]

1.3.1 Part a

Suppose the entire cable is rolled up on the ground next to a 100-foot building. How much work (in ft-lbs) is required to bring the entire cable to the roof of the building? [Answer: 30,000 ft-lbs]

[Hint: No integral is required, since the whole weight is lifted the entire distance.]

1.3.2 Part b

Suppose the cable is hanging from the top of the building to the ground. How much work (in ft-lbs) is required to pull the entire cable to the roof? [Answer: 15,000 ft-lbs]

1.3.3 Part c

Why is the work less in part b than in part a?

1.4 Question 4

A cylindrical water tank with depth of 4 feet and radius of 8 feet has one circular base on the ground. If the tank is full, how much work (in ft-lbs) is required to pump all the water in the tank 5 feet above the top of the tank (9 feet above the ground). Note: Water weighs 62.4 lbs/ft^3. [Answer: 351,295 ft-lbs]

[Hint: This is similar to, but easier than, Example 4, since the radius is the same at every depth.]