

Calculus Worksheet #1 Unit 12 page 1 _____

Use calculus to find the total amount of work done in each of the following problems. Where appropriate, express your answers rounded to 3 significant figures.

1. A water tank is in the shape of a right, circular cone with axis vertical. The tank is 25 feet tall, and the top has a radius of 10 feet. The tank is empty initially, but water is pumped from a near-by lake through a pipe that goes into the bottom of the tank. If the bottom of the tank is 40 feet above the surface of the lake, then how much work is done in filling the tank. (Assume that a cubic foot of water weighs 62.4 pounds.)

2. Suppose that a large spring has a natural length of 2 feet and that a force of 15 pounds is needed to compress it to a length of 1.9 feet. How much work is being done in compressing the spring from a length of 1.9 feet to a length of 1.5 feet? (According to Hook's Law, the force required to compress the spring is directly proportional to the distance the spring is compressed.)

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Use calculus to find the total amount of work done in each of the following problems. Where appropriate, express your answers rounded to 3 significant figures.

3. A 700 pound pallet of roofing material is lifted to the roof of a 75 foot tall building using a cable that weighs 20 pounds per foot. How much work is done?

4. How much work is done in lifting a 500 pound object from the surface of the earth to a point that is 1000 miles above the surface of the earth. (The force of gravity exerted on an object is inversely proportional to the square of the distance between the object and the center of the earth. Assume that the earth is a sphere with a radius of 4000 miles.)