Student: Cole Lamers **Date:** 10/19/19	**Instructor:** Viktoriya Shcherban **Course:** Calc 1 11:30 AM / Internet (81749&81750) Shcherban **Assignment:** 6.5 Work and Fluid Forces

1. It takes 1500 J of work to stretch a spring from its natural length of 1 m to a length of 5 m. Find the force constant of the spring.

    The spring's force constant is   187.5   N / m.
    (Type an integer or a simplified fraction.)

2. A force of 2 N will stretch a rubber band 4 cm (0.04 m). Assuming that Hooke's law applies, how far will a 6-N force stretch the rubber band? How much work does it take to stretch the rubber band this far?

    How far will a 6-N force stretch the rubber band?

        .12   m
    (Simplify your answer.)

    How much work does it take to stretch the rubber band this far?

        .36   J
    (Simplify your answer.)

3. It takes a force of 21,804 lb to compress a coil spring assembly from its free height of 7 inches to its fully compressed height of 4 inches.

    a. What is the assembly's force constant?
    b. How much work does it take to compress the assembly the first half inch? the second half inch? Answer to the nearest in-lb.

    a. k =   7268   lb/in

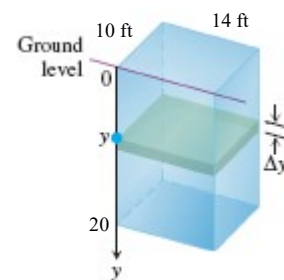   **b.** How much work does it take to compress the assembly the first half inch?

        909   in-lb   (Round to the nearest whole number as needed.)

    How much work does it take to compress the assembly the second half inch?

        2726   in-lb   (Round to the nearest whole number as needed.)

4. The rectangular tank shown here, with its top at ground level, is used to catch runoff water. Assume that the water weighs 62.5 lb / ft^3.
    a. How much work does it take to empty the tank by pumping the water back to ground level once the tank is full?
    b. If the water is pumped to ground level with a (5 / 11)-horsepower (hp) motor (work output 250 ft-lb/sec), how long will it take to empty the tank (to the nearest minute)?
    c. Show that the pump in part (b) will lower the water level 10 ft (halfway) during the first 29 minutes of pumping.
    d. What are the answers to parts (a) and (b) in a location where water weighs 62.19 lb / ft^3? 62.71 lb / ft^3?

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a. Set up an integral to find the work done. Note that the positive y direction measures distance below the ground in this problem.

$$W = \int_{0}^{20} \boxed{8750y} \; dy$$

How much work does it take to empty the tank?

$\boxed{1750000}$ ft-lb

b. How long will it take to empty the tank?

$\boxed{117}$ minutes (Round to the nearest minute as needed.)

c. How much work does it take to lower the water level halfway?

$\boxed{437500}$ ft-lb

It will take the pump $\boxed{29}$ minutes to do this work, so the pump $\boxed{\text{will}}$ lower the water level halfway during the first 29 minutes of pumping.
(Round to the nearest minute as needed.)

d. In a location where water weighs 62.19 lb / ft^3, it will take $\boxed{1741320}$ ft-lb of work to empty the tank, and it will take $\boxed{116}$ minutes to empty the tank.
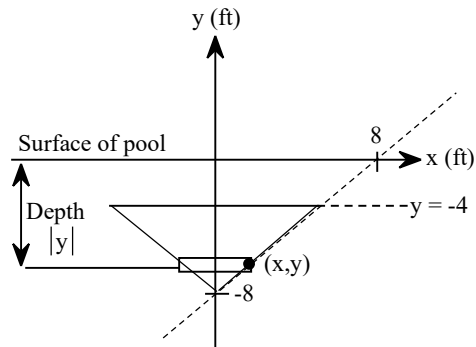
In a location where water weighs 62.71 lb / ft^3, it will take $\boxed{1755880}$ ft-lb of work to empty the tank, and it will take $\boxed{117}$ minutes to empty the tank.

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5. A vertical right circular cylindrical tank measures 28 ft high and 20 ft in diameter. It is full of liquid weighing 62.4 lb / ft^3. How much work does it take to pump the liquid to the level of the top of the tank?

The amount of work required is $\boxed{2446080\pi}$ ft-lb.
(Round to the nearest whole number as needed.)

6.

Calculate the fluid force on one side of the plate using the coordinate system shown below. Assume the density is 62.4 lb / ft^3.

The fluid force on one side of the plate is _____5324.8_____ lb.

7. The viewing portion of the rectangular glass window in a fish tank is 63 inches wide and runs from 2.5 inches below the water's surface to 47.5 inches below the surface. Find the fluid force against this portion of the window. The weight-density of seawater is 64 lb / ft^3.

What is the fluid force against the window?

_____2625_____ lb