MATH 22 PRACTICE EXAM ON WORK

Name:

Section:

Instructions:

(1) Books, notes, and calculators are not permitted.
(2) Simplify as instructed. On some problems, unsimplified correct answers will not receive full credit.
(3) Show your work as instructed. On some problems, correct answers without justification will not receive full credit.

(1)

(2)

(3)

(4)

(5)

(6)

Total

Problem 1. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Recall that 1m^3 of water has mass 1000kg, and consider the following tasks:

(1) Pumping water out of a $1\text{m} \times 1\text{m} \times 1\text{m}$ cubic tank, to the height of the top of the tank.
(2) Raising a 1000kg rigid object one meter vertically.

Which of the tasks requires more work?

A. Pumping the water.

B. Raising the object.

C. Both tasks require exactly the same amount of work.

D. It depends how the volume of the object compares to 1m^3.

E. None of these.

Problem 2. (5 pts.) Circle the correct answer. There will be no partial credit. You do not need to show your work.

Consider the following ways of raising a 1-kg object 1m up:

(1) Raise the object 1m vertically.
(2) Raise the object $\sqrt{2}\,\text{m}$ diagonally at an angle of $45°$.

Which task requires more work?

A. Raising vertically.

B. Raising diagonally.

C. Both require exactly the same amount of work.

D. It depends upon the volume of the object.

E. None of these.

Problem 3. (15 pts.) A force of 30 N is required to maintain a spring stretched from its natural length of 12 cm to a length of 15 cm. How much work is done in stretching the spring from 12 cm to 20 cm? Show your work and simplify your answer.

Problem 4. (15 pts.) A 600-lb weight is suspended by a 200-ft cable that weights 10 lb/ft. How much work is required to raise the weight a distance of 30 ft? Show your work and simplify your answer.

Problem 5. (15 pts.) A 10-ft chain weighs 30 pounds and is suspended at one end from the top of a 40-ft building. Find the work done in pulling 5 ft of cable to the top of the building, so that the remaining 5 ft is still hanging. Show your work and simplify your answer.

Problem 6. (15 pts.) A tank has the shape of an inverted circular cone with height 12 m and base radius 5 m. It is filled with water of depth 8 m. Find the work required to pump water to the top of the tank until the remaining water has depth 4 m. Show your work and simplify your answer.

Problem 7. (15 pts.) Recall that 1m^3 of water has mass 1000kg, and consider the following tasks:

(1) Pumping water out of a bm $\times$ bm $\times$ $\frac{1}{b^2}$m tank ($\frac{1}{b^2}$ is the depth), to the height of the top of the tank.
(2) Raising a 1000kg object one meter vertically.

For what value of b do the two tasks require exactly the same amount of work?