7. [10 points] On her latest hiking expedition, Emily has scaled up a cliff face with a height of 30 feet, and is now using her rope to pull up her camping supplies after her. The supplies are initially on the ground, and are pulled directly upward by the rope. Assume that the rope initially extends from the top of the cliff to the ground in a straight vertical line (so that the rope initially has length 30 feet). The rope has a density of 0.5 pounds per foot, and the supplies weigh 35 pounds.

a. [2 points] Suppose that Emily has lifted the supplies x feet from the ground (so that Emily has reeled in x feet of the rope). Find an expression in terms of x for the total weight, in pounds, of the supplies and the remaining length of rope being used to support the supplies.

Answer: _____.

b. [4 points] Find an expression involving one or more integrals for the total work done in lifting the supplies 20 feet above the ground using the rope. Do **not** evaluate any integrals in your expression. Include units.

Answer: _____

Answer: Units: _____

c. [4 points] After lifting the supplies 20 feet, the water tank in Emily's supplies bag is pierced, and begins to leak, so that the weight of the supplies decreases by 0.2 pounds per foot. Find an expression involving one or more integrals for the total work done in lifting the supplies the remaining distance of 10 feet using the rope. Do **not** evaluate any integrals in your expression. Include units.

Answer: _____

Answer: Units: _____