4. [14 points] Using a rope, it takes 8 minutes to lift a 50-pound box of dirt from the ground to a height of 20 feet above the ground. As the box is lifted, dirt falls out of the box at a constant rate such that a total of 2 pounds of dirt has been lost when it reaches the final height of 20 feet.

a. [4 points] Let h be the height, in feet, of the box above the ground. Write an expression estimating the work done in raising the box from a height of h_i feet to a height of $h_i + \Delta h$ feet, ignoring the weight of the rope.

b. [3 points] Find the total amount of work done in raising the box of dirt from the ground to the final height of 20 feet, ignoring the weight of the rope.

c. [7 points] Suppose the rope lifting the box of dirt weighs 1.5 pounds per foot and dangles from a platform that is 30 feet above the ground. Find the total work done to lift the box of dirt to a height of 20 feet above the ground, taking into account the weight of the rope.