5. [7 points] Lovise is a character in a video game. As part of the game she lifts a crate straight up from the ground to a height of 60 m. Gravity in this video game world is not constant! At a height of h meters above the ground, the acceleration due to gravity is $7e^{-h}$ meters per second per second. The crate has a mass of 5 kg.

Recall: Weight is the force exerted by gravity and is equal to mass times acceleration due to gravity.

a. [3 points] Write an expression that approximates the amount of work done by Lovise in the video game to lift the crate from a height of h meters above the ground to $h + \Delta h$ meters above the ground. (Assume here that Δh is positive but very small.)
Your expression should <u>not</u> involve any integrals.

Answer: Work $\approx$ _____

b. [4 points] Write and evaluate an integral that gives the total work done by the character Lovise in lifting the crate to a height of 60m above the ground.
(You may do this by hand or by using your calculator. Give an exact answer or round your answer to two decimal places.)

Answer: Integral Expression: _____

Numerical Final Answer (with units): _____

