6. [8 points] Derivative Girl lifts a bucket of water at a constant velocity from the ground up to a platform 50 meters above the ground. The bucket and water start at a total mass of 20 kg, but while it is being lifted, a total of 3 kg of water drips out at a steady rate through a hole in the bottom of the bucket.

For this problem, you may assume that acceleration due to gravity is $g = 9.8$ m/s^2.

    a. [2 points] Give an expression giving the mass of the bucket and water when the bucket is h meters above ground. Include units.

Answer: Mass of water $= \underline{\hspace{3cm} 20 - \frac{3}{50}h \textbf{ kg} \hspace{3cm}}$

    b. [3 points] Suppose Δh is small. Write an expression (not involving integrals) that approximates the work required to lift the bucket from a height of h meters above the ground to a height of $h + \Delta h$ meters above the ground. Include units.

Answer: Work $\approx \underline{\hspace{2cm} 9.8(20 - \frac{3}{50}h)\Delta h \textbf{ joules} \hspace{2cm}}$

    c. [3 points] Write, but do not evaluate, an integral that gives the work required to lift the bucket from the ground to the platform. Include units.

Answer: $\underline{\hspace{1cm} \displaystyle\int_0^{50} 9.8\left(20 - \frac{3}{50}h\right) dh \textbf{ joules} \hspace{1cm}}$