An object with mass m is shot vertically up with a velocity of 200 m/s, Air resistance R is proportional to the square of the velocity $R = -mkv^2$, where $k = 0.010\ m^{-1}$

a) how high does the object reach?

b) What velocity does the object have when it hits the ground?

a) $-mg - mkv^2 = ma$

$-(g + kv^2) = a$

$-(g + kv^2) = v\frac{dv}{dy}$

$-\int_0^h dy = \int_{v_0}^{0} v\frac{dv}{(g+kv^2)}$ ⟶

$-h = \int_{v_0}^{0} \frac{v}{u}\cdot\frac{du}{2kv}$

$-h = \left[\frac{1}{2k}\ln(g+kv^2)\right]_{v_0}^{0}$

$-h = \frac{1}{2k}\ln g - \left(\frac{1}{2k}\ln(g+kv_0^2)\right)$

$h = \frac{1}{2k}\ln\left(\frac{g+kv^2}{g}\right)$

$h = \frac{1}{2\cdot 0{,}01}\ln\left(\frac{9.81 + 0.01\cdot 200^2}{9.81}\right)$

$h = 186.6\ m$

$a = \frac{dv}{dt}\cdot\frac{dy}{dy}$

$a = v\frac{dv}{dy}$

$u = g + kv^2$

$du = 2kv\,dv$

$dv = \frac{du}{2kv}$

b) ?