[mex257] Exponential attenuation

A particle of mass m is launched at time $t = 0$ from position $x = 0$ in positive x-direction with initial velocity v_0. Acting on the particle, while it moves with $v > 0$, is the attenuating force $F = -fe^{v/c}$, where f, c are positive constants.
(a) At what time τ does the particle come to a stop?
(b) At what position R does the particle come to a stop? Hint: Use $dv/dx = (dv/dt)(dx/dt)^{-1}$.
(c) What are the maximum values of τ and R that this attenuating force permits, irrespective of how large v_0 is?
(d) For $v_0 \ll c$, the attenuating force can be interpreted as kinetic friction, $F \simeq -f = \text{const}$ with $f \doteq \mu_k mg$. What are the values of τ and R in this regime?

Solution: