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 $\tau$ 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 $\tau$ 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 $f = \mu_k mg$. What are the values of $\tau$ and $R$ in this regime?

Solution: