Physics 303, Test I, Fall 2004

NAME:

(1): Which of the following describe periodic motion. For those cases, find the period. If in addition, the motion is also simple harmonic, find the amplitude of the motion.

\[ x = \cosh(t) \]  
\[ x = \cos(2t) + 6\cos(4t) \]  
\[ x = 2 - \cos(t), \ y = \sin(0.5t + 0.5) \]  
\[ x = \sec(t) \]  
\[ z = a + b\cos(2t) + c\sin(2t) \]  
\[ y = e^{-t}\cos(t) \]

(2): Find the equilibrium points and determine their stability for a particle of mass \( m \) subjected to a force \( f(x) = cx + x^3 \) for (a) \( c < 0 \) (b) \( c > 0 \) (c) \( c = 0 \).

(3): Consider a charged particle of charge \( q \) and mass \( m \) moving horizontally in a constant electric field \( E \), in a medium with resistive force \( mkv \). Calculate the time for its velocity to become half of its original value.

(4): Consider a particle of mass \( m \) thrown at an angle \( \theta \) with a velocity \( v_0 \) in a medium with resistive force \( mkv^2 \).
(a) Calculate \( x \) as a function of velocity for both upward and downward motion.
(b) Calculate the terminal speed of the particle.
(c) (EXTRA CREDIT) Does the particle ever reach this terminal velocity? Explain.