1) You want to through a rock and break a window (you got a bad grade on your PH350 test). If you're on level ground and the rock is going to leave your hand at a height h_0 a distance d from the building, and the window is a height h above the ground, how fast should you throw the rock at a given angle θ? Assume that the height of the window is higher than the initial height of the rock (think of how it would change your answer if it were less)

2) An object moving in one dimension has velocity as a function of position given by
$$v_0 x_0 \cos\left(\frac{x}{x_0}\right)/x$$
What is the net force acting on this object.

3) Consider a uniform rod of stuff that is much longer than its radius. This stuff creates a gravitational field. Find the gravitational field as a function of distance from the axis of the rod when you are close enough to it that you can consider its length infinite. Then find the gravitational potential for the rod. Then plot the two functions as a function of distance from the axis of the rod.

4) Consider a lightly damped simple harmonic oscillator. The general solution was
$$x(t) = e^{-\beta t}[A\cos(\omega_1 t) + B\sin(\omega_1 t)]$$
If the initial position is x_0 and the initial velocity is v_0, then solve for A and B. Also solve for the times when the position is a maximum (think about how you would figure out when it's actually a maximum vs a minimum; there's an easier way than to brute force solve for the acceleration).