Problem 20

Assume that the system described by the equation $mu'' + \gamma u' + ku = 0$ is critically damped and that the initial conditions are $u(0) = u_0$, $u'(0) = v_0$. If $v_0 = 0$, show that $u \to 0$ as $t \to \infty$ but that $u$ is never zero. If $u_0$ is positive, determine a condition on $v_0$ that will ensure that the mass passes through its equilibrium position after it is released.