Vibrating Springs- HW Problems

1. A mass of 1000g is attached to a spring which is stretched 25cm by a force of 9N. At time $t = 0$ the mass is moved stretching the spring 2m to the right, and setting it in motion with an intial velocity of 6m/sec to the left. Find the position of the mass at time $t, x(t)$. Write $x(t)$ in the form $x(t) = Ccos(\omega t - \alpha)$. Find the amplitude and period of the motion.

In problems 2-5 a mass is attached to a spring, with spring constant k, and a dashpot, with damping constant c. The initial velocity of the mass is v_0 and the initial position is x_0. Find the position function of the mass, $x(t)$, and identify if the motion is overdamped, critically damped, or underdamped. If the motion is underdamped, write the position in the form $x(t) = Ce^{-\rho t}(\cos(\omega t - \alpha))$. Also find the undamped position function (ie where $c = 0$), $u(t) = Ccos(\omega t - \alpha)$.

2. $m = 2, \quad k = 50, \quad c = 12, \quad x_0 = -1, \quad v_0 = -1$

3. $m = 2, \quad k = 6, \quad c = 8, \quad x_0 = 3, \quad v_0 = 2$

4. $m = 1, \quad k = 9, \quad c = 6, \quad x_0 = -2, \quad v_0 = -6$

5. $m = 1, \quad k = 50, \quad c = 10, \quad x_0 = 0, \quad v_0 = 10.$