Math 2326, Test III

Name _____

1. Find the general solution of $w'' + 4w' + 5w = 78e^{3t}$

   answer: $w(t) = C_1 e^{-2t} cos(t) + C_2 e^{-2t} sin(t) + 3e^{3t}$

2. Solve $w'' + 4w' + 4w = 12t, w(0) = 0, w'(0) = 1$:

   answer: $w(t) = 3e^{-2t} + 4te^{-2t} + 3t - 3$

3. Find the inverse Laplace transform of $F(s) = \frac{e^{-3s}}{s^2+4s+20}$

   answer: $f(t) = \frac{1}{4} u_3(t) e^{-2(t-3)} sin(4(t-3))$

4. Find all 4 of the equilibrium points of the nonlinear system:

$$\frac{dx}{dt} = 4x - x^2 - xy$$
$$\frac{dy}{dt} = 3y - y^2 - 2xy$$

and classify any two of them as source, sink, saddle point, spiral source, spiral sink, or center.

answer: (0,0) is source, (0,3) is saddle, (4,0) is sink, (-1,5) is spiral sink

5. Solve, **using Laplace transforms**:
$y'' + 5y' + 4y = 84e^{3t}$, with $y(0) = 0, y'(0) = 0$

answer: $y(t) = 3e^{3t} + 4e^{-4t} - 7e^{-t}$