Math 2326, Test III

Name _____

1. Find the general solution:
   $w'' + 5w' + 4w = 8t^2$

   answer: $w(t) = C_1 e^{-4t} + C_2 e^{-t} + 2t^2 - 5t + 21/4$

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

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

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

   answer: $(0,0)$ is source, $(0,3)$ is sink, $(2,0)$ is sink, $(1,1)$ is saddle

3. Find the Laplace transform of the solution to:
   $y'' + 5y' + 4y = 8t^2$, with $y(0) = 1, y'(0) = -1$

   answer: $L(y) = \frac{16}{s^3(s^2+5s+4)} + \frac{1}{s+1}$

4. Find the inverse Laplace transform of $F(s) = \frac{e^{-3s}}{s^2+1}$

   answer: $f(t) = u_3(t)sin(t-3)$

5. Solve **using Laplace transforms**:
   $y' + 4y = 0$, with $y(0) = 3$

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