

Math 2326, Test III

Name _____

1. Find the general solution:

$$w'' + 10w' + 25w = e^{3t}$$

answer: $w(t) = C_1e^{-5t} + C_2te^{-5t} + \frac{1}{64}e^{3t}$

2. Find the general solution:

$$y''' - y'' + 7y' = 28$$

answer: $y(t) = C_1 + e^{t/2}[C_2\cos(\sqrt{27}t/2) + C_3\sin(\sqrt{27}t/2)] + 4t$

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

$$\begin{aligned}\frac{dx}{dt} &= x(-x - 3y + 150) \\ \frac{dy}{dt} &= y(-2x - y + 100)\end{aligned}$$

(0,0) is one of the equilibrium points, classify it as a source, sink or saddle point.

answer: (0, 0), (0, 100), (150, 0), (30, 40); (0, 0) is a source

4. Find the Laplace transform of the solution of $y'' - 3y' + 5y = g(t)$, with $y(0) = 0, y'(0) = 2$, where $g(t) = 0$ for $t < 2$ and $g(t) = e^{2t}$ for $t \geq 2$.

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

5. Solve, **using Laplace transforms** $y' + 2y = 4e^{2t}$, with $y(0) = 0$.

answer: $y(t) = e^{2t} - e^{-2t}$